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PACIFIC CENTRE FOR ENVIRONMENT AND SUSTAINABLE DEVELOPMENT

Community Mapping and QGIS

A climate and disaster risk mapping toolkit for local communities

Community mapping is mapping that is carried out by the communities FOR the communities.

GCCA Global Climate Change Alliance

European Union

This document is a guide on the application of QGIS in community mapping. It aims to help communities understand the risks, vulnerabilities and their location in their communities. Communities can use it to collect, edit, store and display data from their communities.

Created by: Siu I Fanga Pouvalu.

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Fiji Islands.

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Acknowledgement

I would like to acknowledge the great leadership and vision of the PaCE-SD Director, Professor Elisabeth Holland. She had initiated the idea to develop this simple Disaster Risk Mapping Tool-kit for the participating communities of the USP EU-GCCA project.

This tool-kit later developed into a resource that can be used by communities affected by climate variation, donors, local government departments, regional organizations, students and academics. In doing so, the use of free open source Geographic Information System (GIS) software is being used and made available to people at the community level.

I would also like to thank Dr. Hélène Jacot des Combes for the continuous guidance in compiling this tool-kit. I am also grateful to Dr. John Lowry and Mojito Jione for their support, constructive comments and technical assistance. I also acknowledge the contributing ideas from Dr. Nick Rollings and Halalilika 'Etika.

I also wish to express my sincere gratitude to Mr Viliamu Iese for allowing me to use and share his collected data from Cicia Island for the purpose of this tool-kit. I sincerely thank the ***Turaga ni koro*** and the kind people of Buretu, Vunisinu/ Nalase and Daku for allowing my team and I to pilot our tools and methods for this publication in their respective communities. ***Vinaka vakalevu!***

I would also like to acknowledge Andra Whiteside, Mavis Yuen and Kevin Maitava whom I worked closely with in field work and digitizing shapefiles to be part of this tool-kit. It is equally important that I acknowledge the PaCE-SD staff and students that voluntarily participated in the first and second trial of this tool-kit. I thank them for their time and feedback that has helped improved this document.

I am honoured to have worked with Christopher Ward, Sarika Chand and the rest of the "awesome shining stars" of the PaCE-SD. I thank each and every one of them for their contributions in making this tool-kit a success!

Lastly, I wish to thank God Almighty for giving me this opportunity to assist the people in our Pacific communities through this tool-kit. Without His guidance this publication would not be what it is and I am grateful! It is my hope that this mapping tool-kit will be used to highlight urgent issues that need assistance from national governments, regional organizations and donor bodies.

Mālō 'aupito!

.....

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Note from the Director

I am pleased to present another important milestone for the Pacific Centre for Environment & Sustainable Development. This publication is aimed to provide technical assistance to Pacific communities, national governments, institutions and donor bodies to be able to visualize and understand the implications of climate change and human activities. This tool-kit does not intend to provide answers but simply a guide for knowledge production and suggesting possible solutions.

I wish to express my appreciation to those that shared their expertise and made this publication possible. It is my intention, that this document becomes a living document that will be revised when needed. I commend the PaCE-SD awesome shining stars for their dedication and hard work in producing this tool-kit for the benefit of the Pacific people.

Thank you!

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Professor Elisabeth Holland
Director, Pacific Centre of Environment
& Sustainable Development.

This tool-kit aims to enable local people to:

- Be able to identify and understand the risks and vulnerabilities that their communities are suffering from.
- Have the skills and knowledge to collect data of their own environment and create a geodatabase of their resources to be kept in their communities.
- Create hand drawn maps of all assets and infrastructures, areas at risk, risks and vulnerabilities in their own communities.
- Transfer collected data onto a desktop and use the Quantum GIS (QGIS) software to highlight issues that their community is facing.
- Visually understand the risks they are facing and keep this knowledge within their communities.
- Use the maps and collected data to present it to their local governments, NGO's or donor bodies to seek assistance.

Who can use this tool-kit?

- This resource aims to support the Pacific people that are at the fore-front of climate change raise awareness and understand the wider implications of climate variation. It is designed to be used by community groups, students, academics, Non-Government Organizations (NGOs), government, private enterprises or donor bodies. Although there is a focus on disaster risk, the technical skills can be applied to business, health, agriculture, livestock, sports & recreation, education, culture, music, myths, legends or any field related to the well-being of the Pacific people.

How to use this tool-kit?

- Before starting with this tool-kit you should know that this tool-kit works like a system. This means that there are inputs, processes and outputs. Inputs include: this guide, the software, images, you and the data that you are going to collect. The processes are: your learning, collecting data and creating maps. The output that you will create at the end is a geodatabase containing information of your community resources, risk and vulnerability maps and an action plan.

- You will need to install some software that is provided as part of this tool-kit. For example, in order for you to be able to create some maps you will need to make sure that the QGIS software is set up on your computer.

- Anyone with the passion to learn new things and accept a challenge can use this tool-kit. Whether you have used a computer or not, you can still use this tool-kit to create a simple map for your community.

- This document is designed to be a guide using entirely free open source software. For new users, you will need to be familiar with your computer/laptop to reduce the level of difficulty. You are also advised to practice and experiment with the software and stay positive at all time. GIS is a very interesting and fascinating technology just like iPhones and tablet computers, you will master it once you have developed an interest!

This tool-kit is divided into 4 parts:

Part 1 – Beginners: Chapter 1 and 2 are for users that are not familiar with computers.

Part 2 – Supporting software: Chapter 3 and 4 are complete tutorials on installing the software.

Part 3 – Getting started: Chapter 5 – 18 introduces the user to geospatial data, collecting and editing data and mapping. Chapter 19 gives the user and the community the opportunity to use the collected data and maps to create an action plan.

Part 4 – Chapter 19 and 20: For users that have access to Internet to download and update software. It is also for users that need georeferenced images of their areas of interest. These two chapters rely entirely on internet connection. Chapter 19 & 20 are designed to teach you how to download and install Google Earth and georeference images of your area of interest. So after Chapter 9, you should complete Chapter 19 & 20 before continuing onto Chapter 10 and the rest of the chapters. More information and tutorials on QGIS can be found on this link http://www.qgis.org/en/docs/index.html.

- This tool-kit consists of; this Guide, video tutorials, Apache Open Office, VideoLAN (VLC) media player, QGIS 2.8. desktop software, georeferenced Google Earth images of individual communities and shapefiles.

- The georeferenced images and shapefiles of the participating communities in the EU GCCA project are however only made available to these individual communities. For tutorials, georeferenced images, shapefiles and data of Cicia Island are also included as part of this tool-kit.

** VLC is a free open source media player provided as part of this tool-kit as a back-up. The VLC media player is provided in case you need a media player to watch the video tutorials provided. Apache Open Office is a free version of Microsoft Office that is also provided with this tool-kit as a back-up. When working with data in QGIS, it is stored and managed using tables. In case users do not have access or have problems with Microsoft Office, the Apache Open Office Spreadsheet allows you to manage your data in tables just like Microsoft Excel.*

** Users must take note that the QGIS desktop software provided with this tool-kit is the latest version at the time of this publication. You can always check for the latest updates on the following link as QGIS will always be developing. https://www.qgis.org/en/site/forusers/download.html.*

** There may be some words that you may not understand the first time you go through this document, but once you are familiar with the software you will find everything a piece of cake! There are also video tutorials for some of the chapters to assist you. Some of the images in this document may be different from what you see on your desktop, whatever happens don't panic! Take time to experiment and explore with the software. A tip for creating maps in GIS is always think simple! Attempt every task knowing that anything is possible!*

Who should be involved?

- In a community setting, it is important to identify members of the community that are capable and willing to carry out the required tasks. Below are simple steps in finding out who should be involved.
- Establish a Community Mapping Team to be led by chief, village leader or village officer.
- Identify and approach members of the community whether they are interested in being part of this team. Members should include men, women and youth.
- Identify at least 2 people to be the Community GIS Officers that will be carrying out most of the mapping in QGIS.
- The rest of the team will assist in collecting and verifying data.
- The Community Mapping Team will be responsible in training members of their community on how to create simple maps.
- The community mapping team will work together to create the database, maps and an action plan that can be presented to government officials, NGO's, donor bodies etc.

Introduction

Mapping includes collecting, organizing, editing, storing and using data to create maps. Maps are a great way to picture 'what' is in an area. Mapping has always been a part of Pacific culture! In fact, the art of mapping is not new to the people of the Pacific and their ancestors. The word 'mapping' and 'Geographic Information System' however are technical terms that have been recently introduced to the region.

Maps have been an integral part of Pacific peoples' way of life, although not presented in paper or digital form. Maps were constructed using sand, coconut fronds, sea shells and rocks. In the Marshall Islands, stick charts consisting of coconut fronds and shells are tied together to form a framework.

These stick charts were used for navigation whereby the coconut fronds represented waves, the ocean surface and shells were used to identify the locations of islands.

The main purpose of this Tool-kit is to encourage direct community involvement in understanding and providing solutions to issues that affect their livelihoods. It also has been structured to empower local people to identify alarming issues that may or may not be related to climate variation; better understand the causes of these issues and their relationship to these issues; show areas, populations and buildings that are at risk; highlight possible solutions and to better represent themselves to local governments and NGOs and/or seek further assistance.

Since you know 'what is where' in your communities, you should find this tool-kit easy! It is anticipated that this publication become a 'living document' embraced upon the shores of the Pacific Islands.

Talamonū atu and all the best!

Nã tõ rourou, nã taku rourou ka ora ai te iwi – With your food basket and my food basket the people will thrive.
~ Maori Proverb

CONTENTS

Chapter 1- Getting to know Windows

Objectives:

By the end of this Chapter, you should be able to:

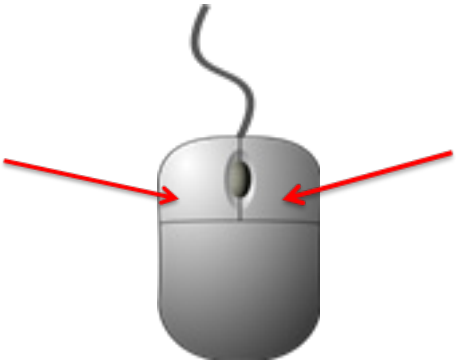
- Identify and understand the features of a desktop.
- Know how to change the date and time.
- Identify the type of operati ng system and system type your computer has.

Having the correct time and date on your computer is very important especially when you will be working with a lot of information about your community. If you haven't switched your computer ON, you may go ahead and turn it on and log in if you have to.

1. If this is your first time to use a computer, it is important that you become familiar with it. Once your computer or laptop is switched ON, you will see the desktop. But before we look at the desktop let's look at how to move around on your screen.

2. You will need to understand that in order to do anything (unless you are using a tablet); you will need to learn how the mouse works. The diagram below shows the parts of the mouse. To move around your screen you will need to move the mouse with your hand.

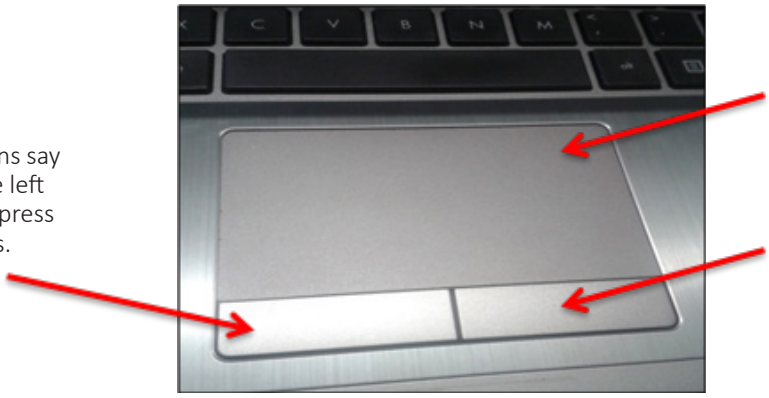
Left button.
When instructions say click or double click, it is the left button that you press with your fingers.



Right button.
When instructions say right click, it is the right button that you press with your fingers.

If you are using a laptop, your mouse pad may look similar to the image on the next page.

Left button.
When instructions say left click, it is the left button that you press with your fingers.

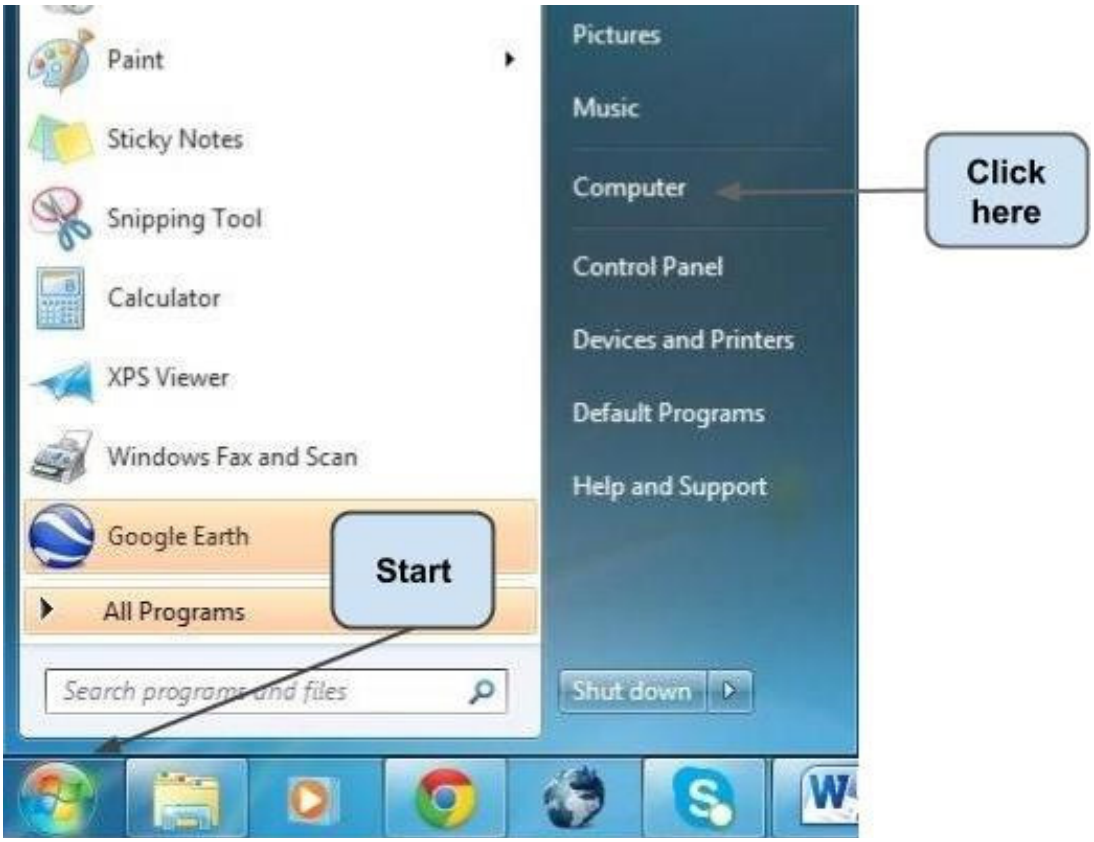


Mouse pad.
To move around the screen, place a finger on the mouse pad and you will see that the arrow will move around your screen.

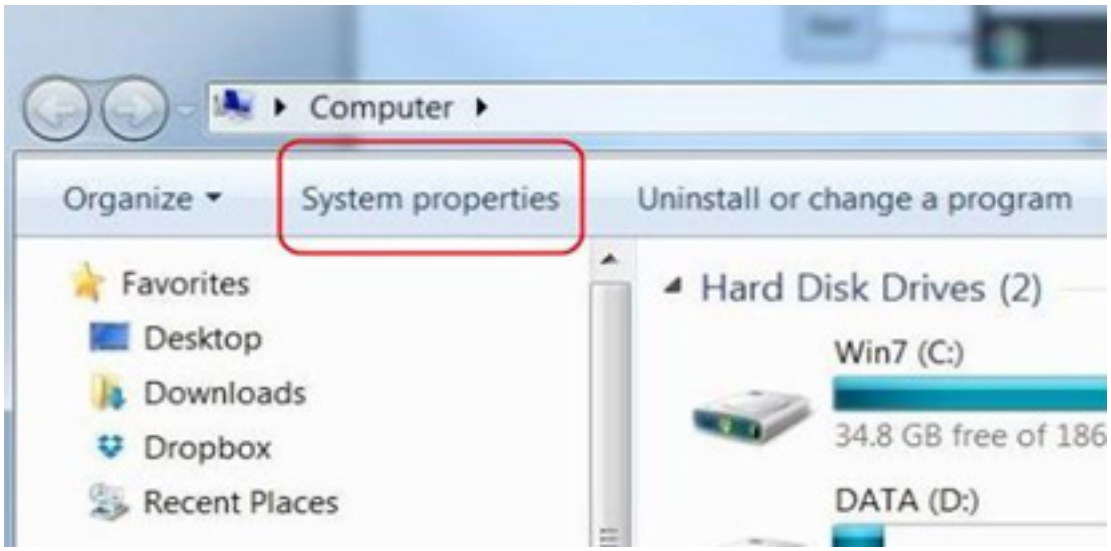
Left button.
When instructions say right click, it is the right button that you press with your fingers.

An important thing to know is the type of operating system your computer has. An operating system is the most important software that supports the functioning of your computer. You will learn more about the importance of knowing the operating system and system type in Chapter 3.

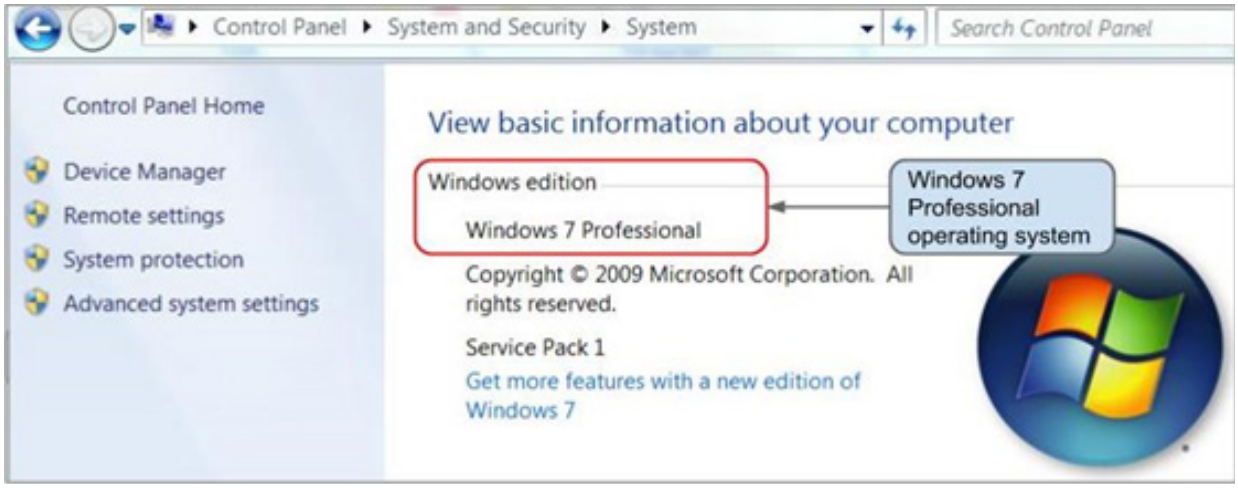
If you are unsure what type of operating system your computer has, go to Start and select Computer.



Click on System Properties to see what the operating system is.



Below is a Windows 7 operating system.



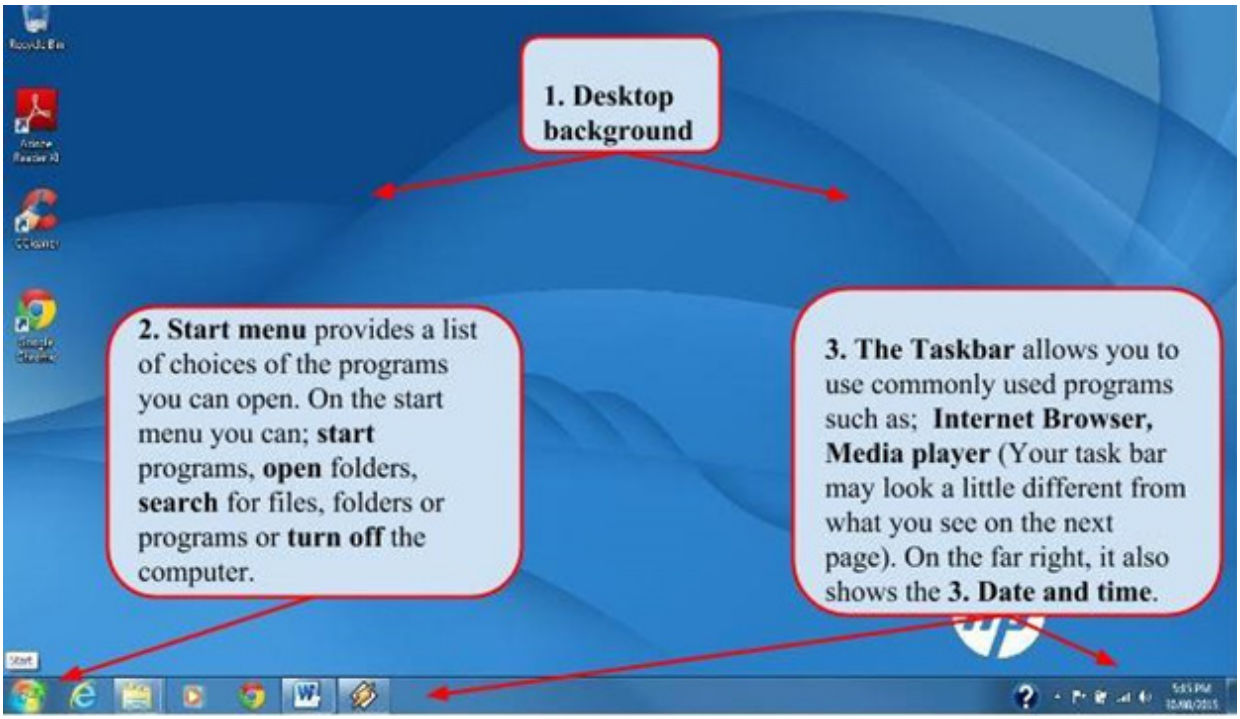
Below is an example of the Windows 8 operating system.

Once you know the Operating System for your Computer, go ahead and close this window.

**Please note that most of the images in this tool-kit were made in Windows 7. However, if you are using a Windows 8 or another operating system you can easily follow, the features will not have a lot of differences.*

Desktop features for Windows 7 Professional

The ***desktop*** includes the 1. ***desktop background***, 2. ***Start menu*** and the 3. ***taskbar***.
**Your desktop may look different from the desktop below.*

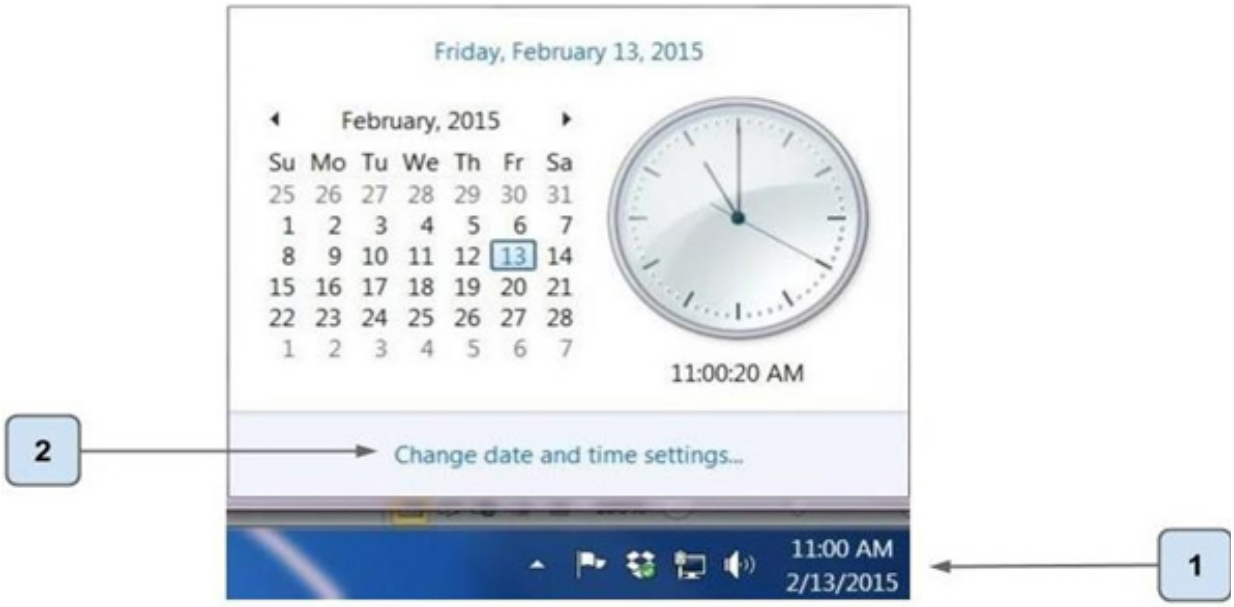


Step 1 – Using your mouse, go to the **start button** and click on it. You will see a similar image to the one below. **If you are not using a Windows 7, it may be different for your computer.*

Time and date

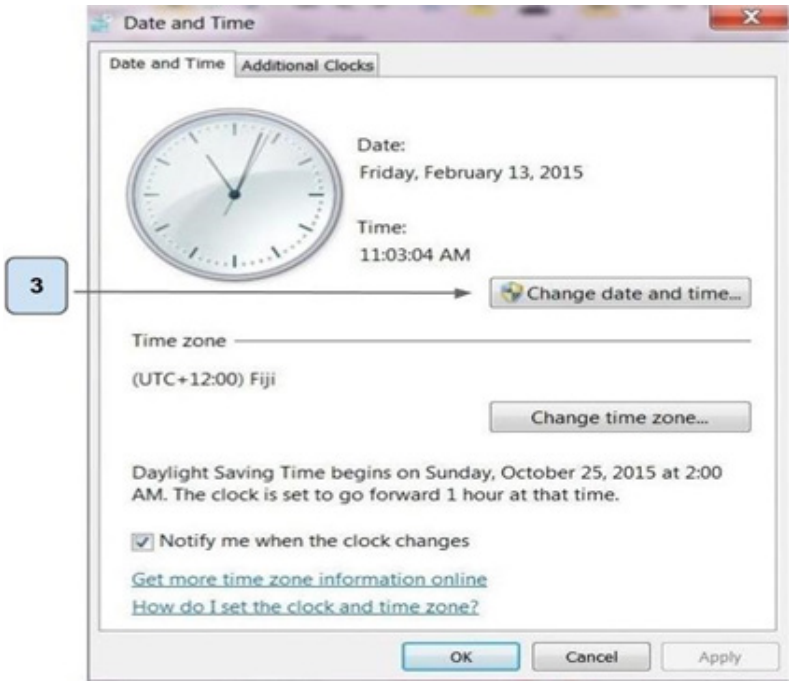
The date and time is very important as the data that you will save will also save the time and date you created and changed it. Check whether the date and time on your computer is correct, if it is incorrect let's correct it.

Step 1 – Click on the ***Time and Date*** at the bottom right hand corner of the taskbar.
Step 2 – Click on the ***Change date and time settings***.



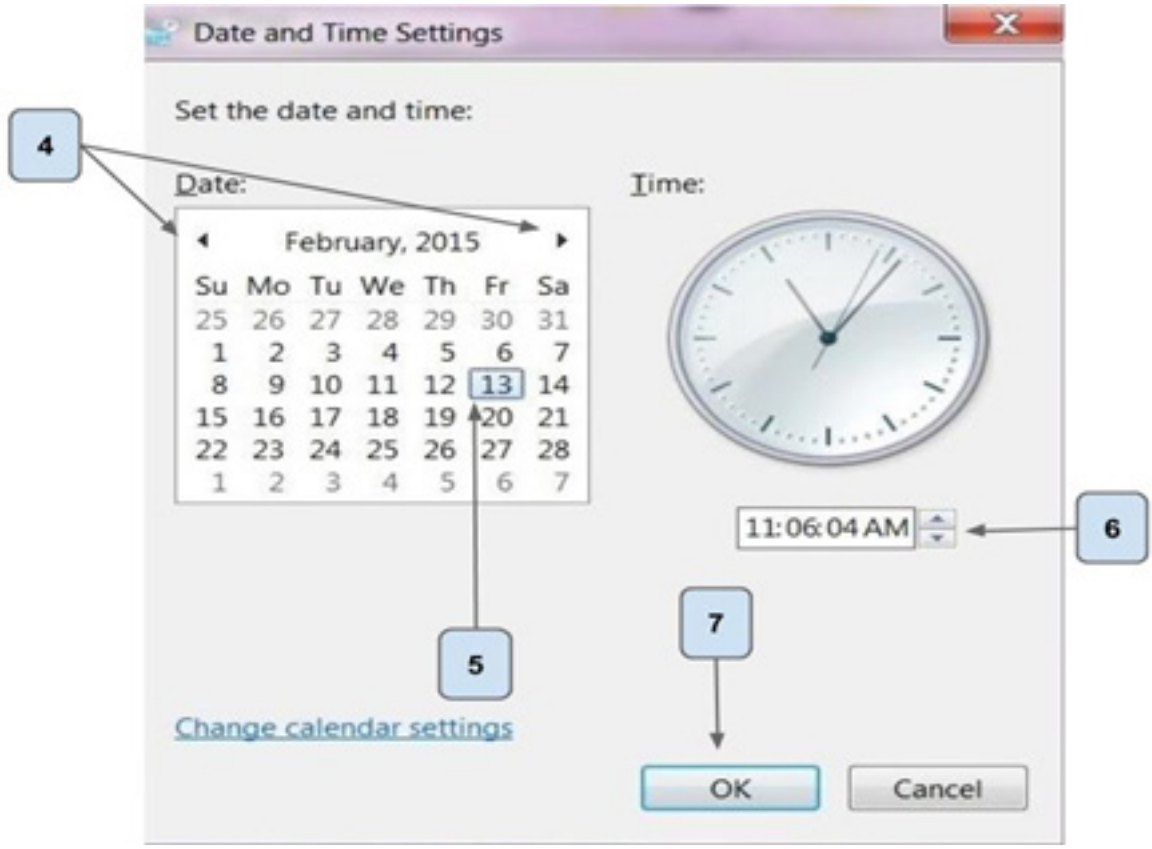
The ***Date and Time*** window will appear where you can change the time and date.

Step 3 – Click on the ***Change date and time*** tab.



The Date and Time Settings window will appear.

Step 4 – To change the date, click on the small arrows to change the months.
Step 5 – Click on today's date.



Step 6 – To change the time, click on the hour, minute or second and then the arrows to change it. Click on AM and then click on the arrow to change it to PM.

Congratulations

You are able to change the date and time settings and are now more familiar with your desktop. We will now copy the files that are in the fl ash drive. Chapter 2 will guide you on how to copy and install the files from the flash drive.

**If you had downloaded this tool-kit from PACE-SD website, go to folder where all files for this tool-kit is saved and then go to Chapter 2 step 8.*

Chapter 2- Copying files from a USB to your computer

Objectives:

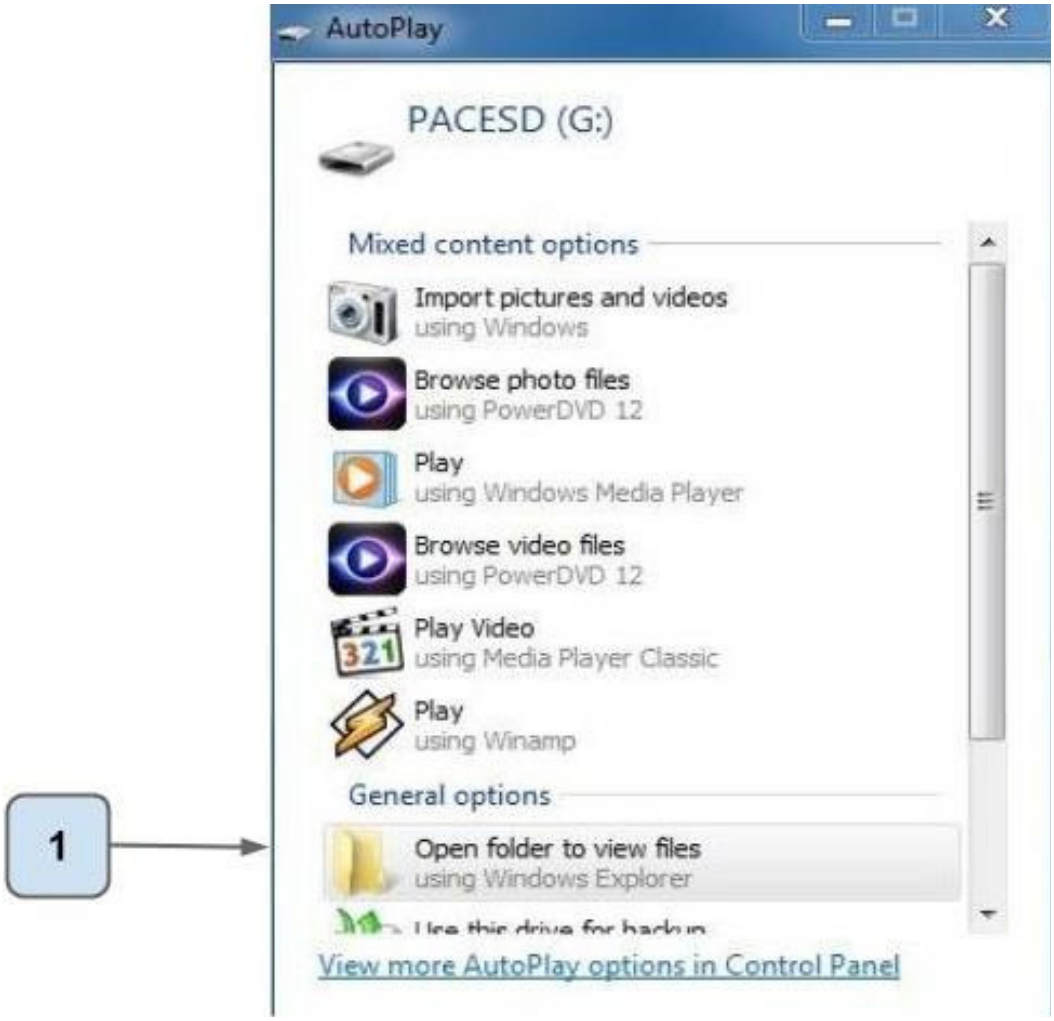
By the end of this Chapter, you should be able to:

- Copy files from one location to another

** To download the entire tool-kit including the datasets go to http://pace.usp.ac.fj. If you downloaded the files from the PaCE-SD website, go to step 8.*

- Plug in the flash drive to any available port on your computer or laptop and wait for your computer to read it.

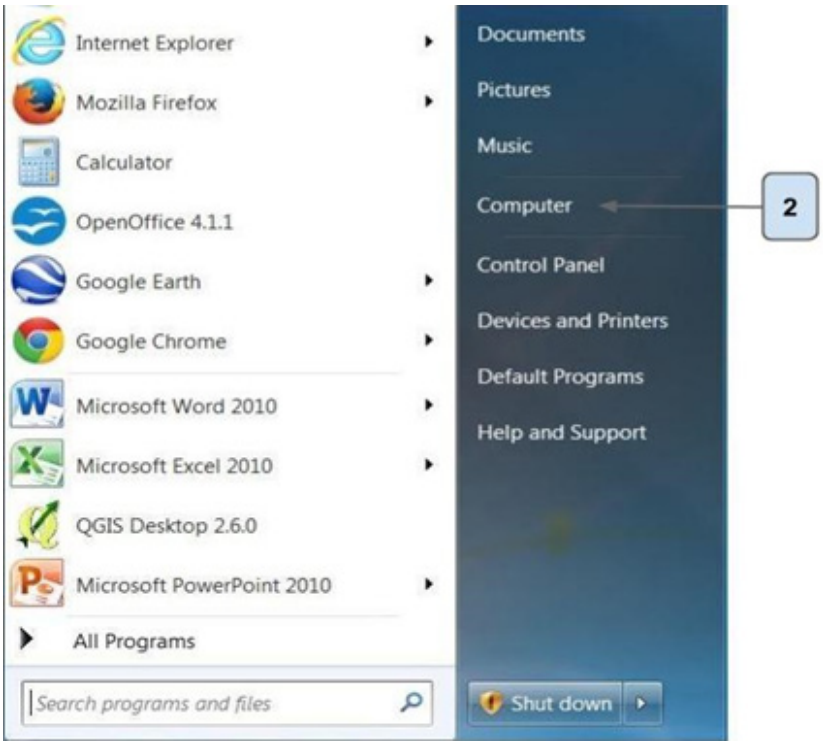
- Once you have plugged in the flash drive, wait for a few seconds for your computer to read the flash drive. Usually an Autoplay dialogue will appear. See image below.



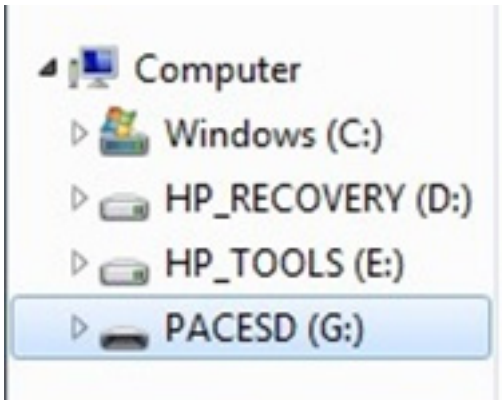
Step 1 – Click on Open folder to view files and then go to **Step 4** on the next page.

If however, you plug in your flash drive and the Autoplay dialogue does not show, then continue with Step 2

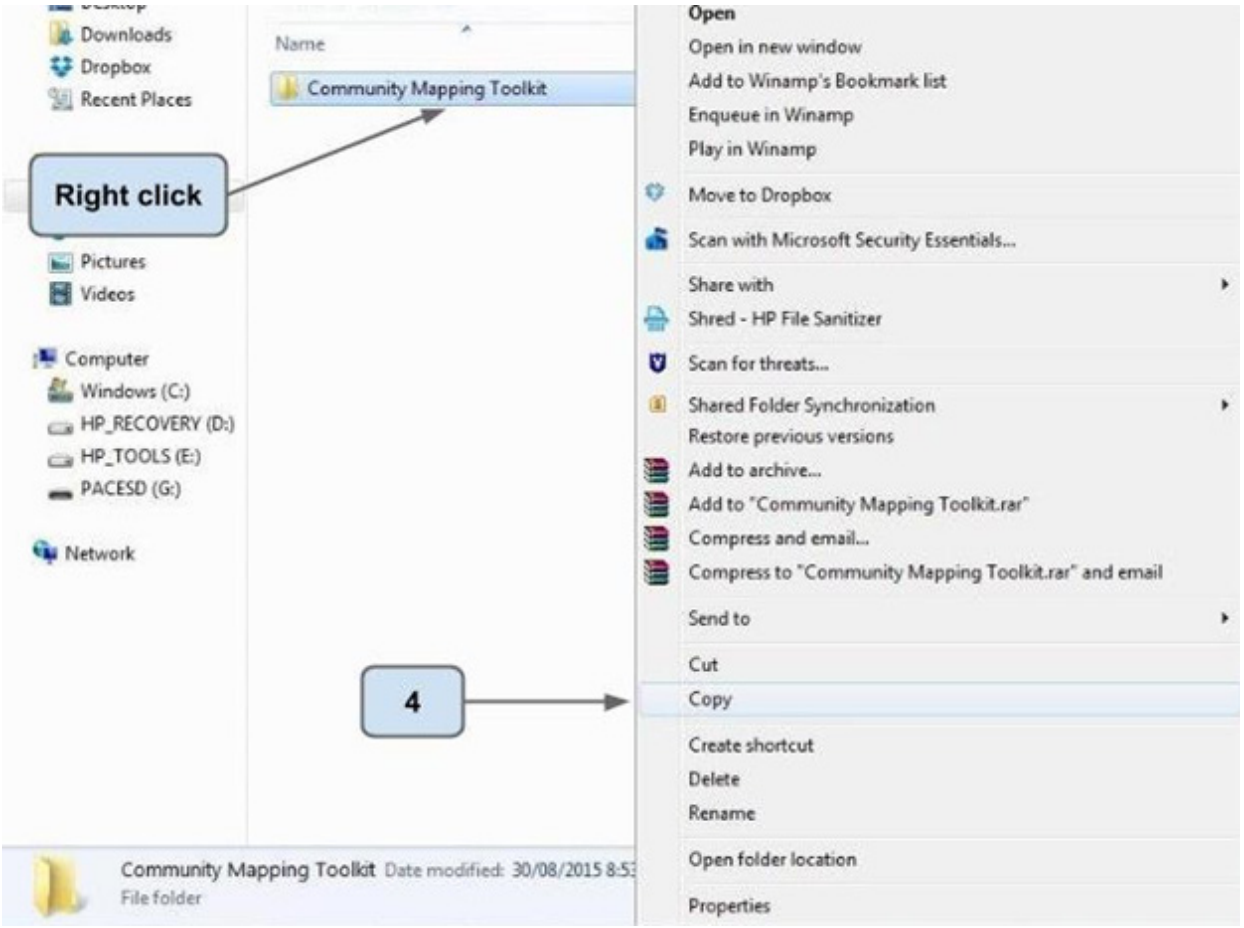
Step 2 – Click on the **Start** menu and then click on **Computer.**



Step 3 – Once the new window appears, click on the icon with the name **PACESD** to open it.

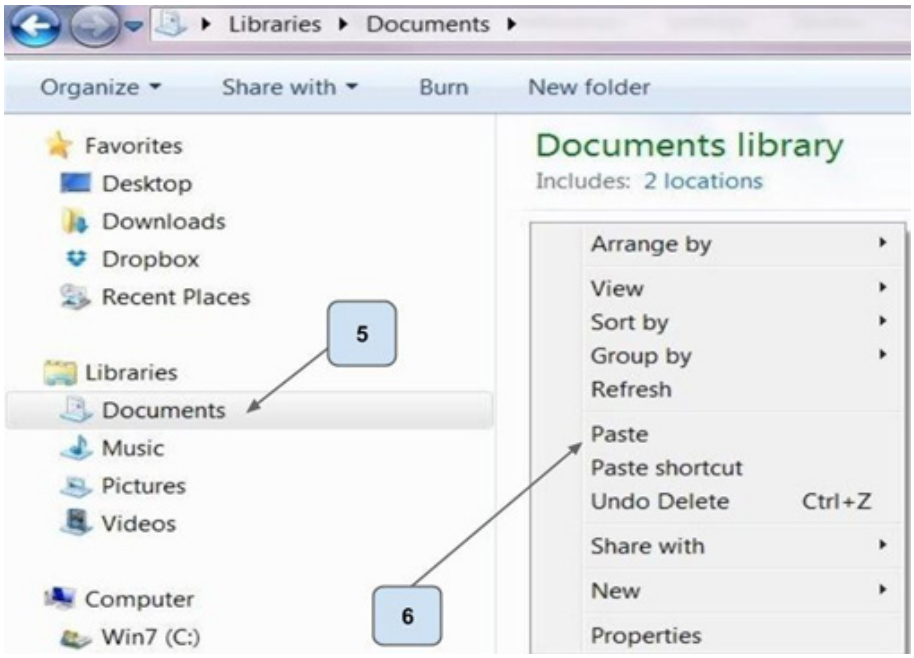


Step 4 – Right click on the **Community Mapping Toolkit** folder and select copy.



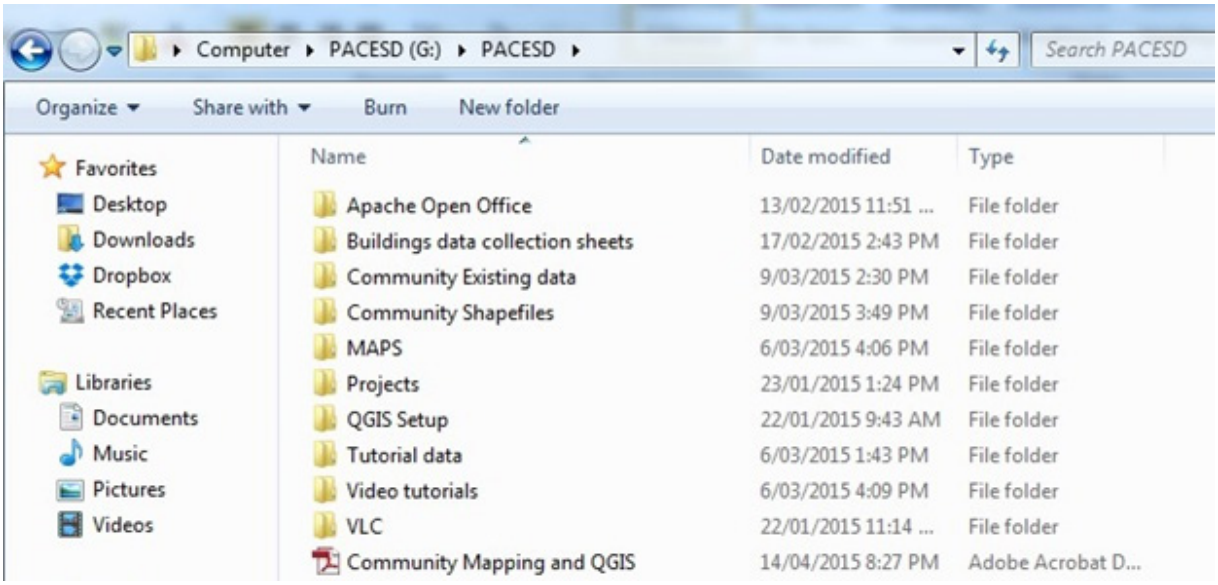
Step 5 – Click on the **Documents** tab.
Step 6 – Right click on an empty space and select **Paste**.

** You are copying the files from the flash drive into the Documents folder on your computer. Whenever you want to work with the tool-kit material, you can find it in your Documents folder.*



You should now be seeing the folder being copied into your Documents folder.

Step 7 – Once copying is complete, double click on the ***Community Mapping Toolkit*** folder to open it.
**You will see the folders as shown in the image below.*



Step 8 – This step only applies if you downloaded the files from the PaCE-SD website. Save the zip file to your Document folder. Right click on the zip folder and select, Extract to Community Mapping & QGIS. This extracts the files from the zip file into a normal folder.

Step 9 – Open the folders to view the contents of each folder.
Step 10 – Close folder.

Chapter 3 will guide you on how to install the software in these folders.

Congratulations

You have just copied the files from the PaCE-SD tool-kit flash drive onto your computer.

Chapter 3- Installing VideoLan (VLC)

Objectives:

By the end of this Chapter, you should be able to:

- Install the correct version of VLC media player onto your computer.

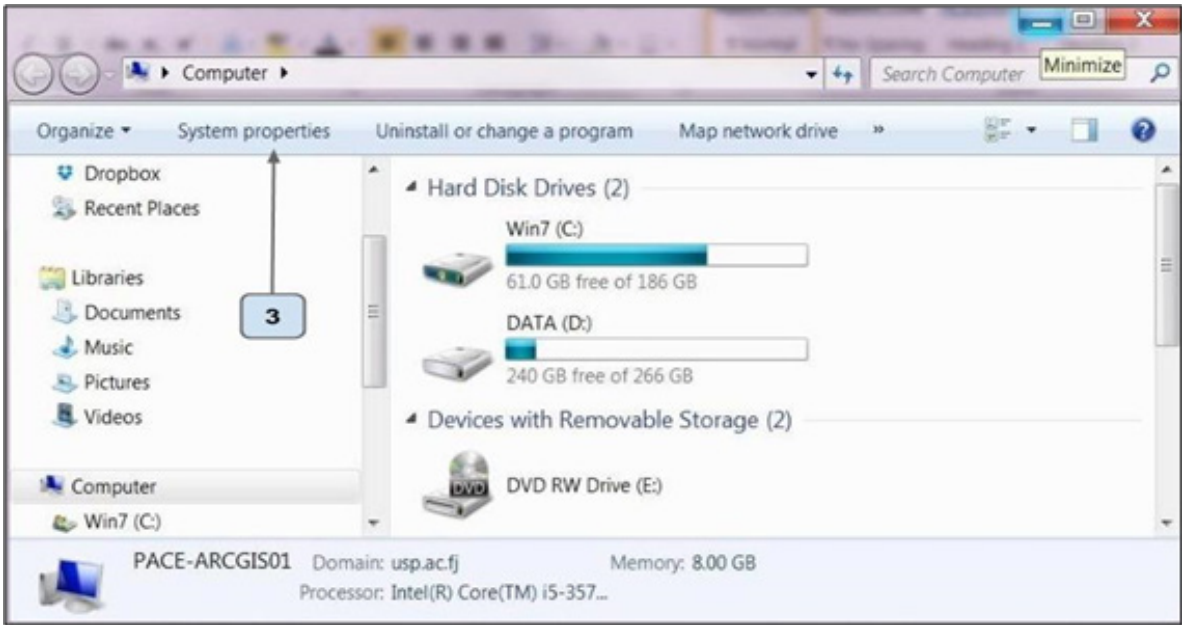
**In order for you to be able to watch the tutorials in this tool-kit it is important that you have a good media player to play these video files. If you have VLC installed or a media player such as the Windows Media Player you may skip this chapter and go to chapter 3. However, you are advised to install VLC.*

Step 1 – Go to the **VLC** folder in the Community Mapping Toolkit package and click on it to open. You will see that there are two versions of the VLC software. One is a **32 bit** (vlc-2.1.5-win32) and a **64 bit** (vlc-2.1.5-win64). One of them is the setup for your computer.

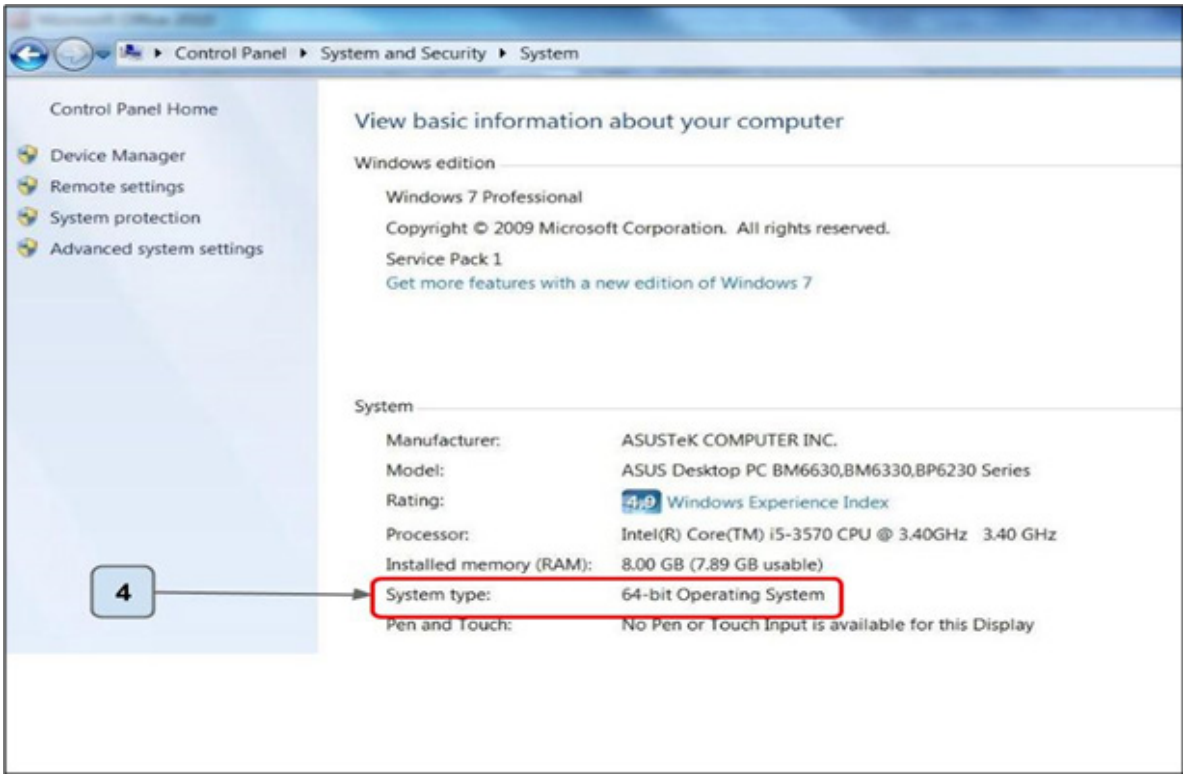
Before you install the software, you will need to find out whether your computer is a **32 bit or 64 bit (system type). This will ensure that the correct version is installed on to your computer.*

Step 2 – Click **Start** and then click on **Computer**.

Step 3 – Click on **System Properties**. **If you are using Windows 8 or MacBook your desktop may look different. Look for System Properties and click on it.*



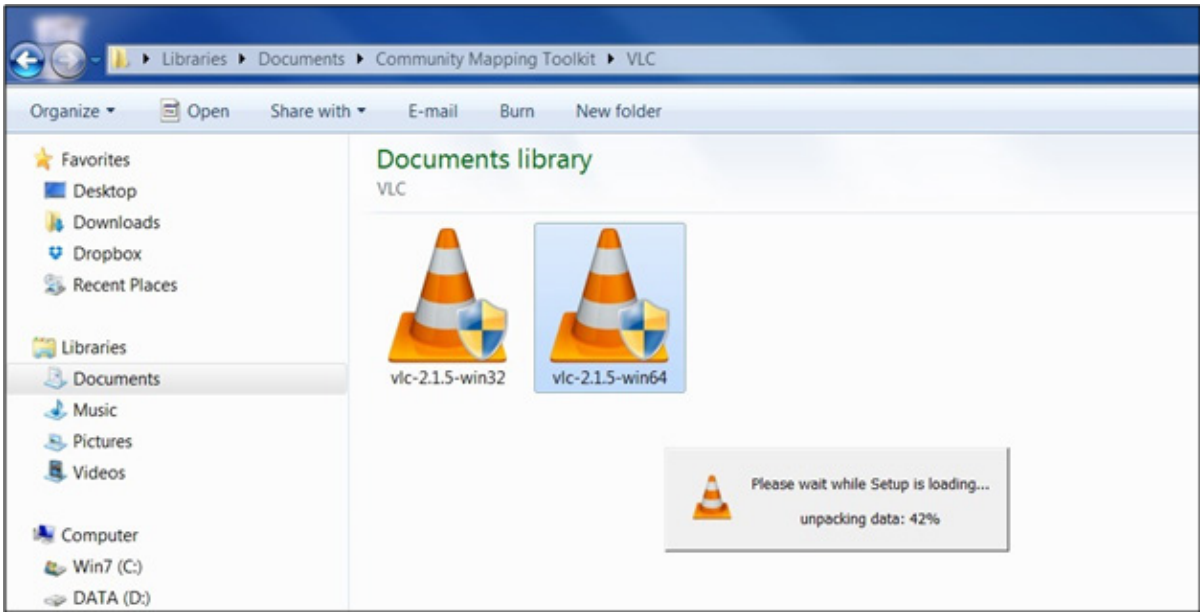
Step 4 – Look at the **System type** to see whether your computer is a **32 bit or 64 bit**. If your computer is a **32 bit**, then you will need to install the **32 bit** version. If however, your computer is a **64 bit** like the image below, you will install the **64 bit** version.



Step 5 – Now that you know the system type, close this window by clicking close  in the top right hand corner.

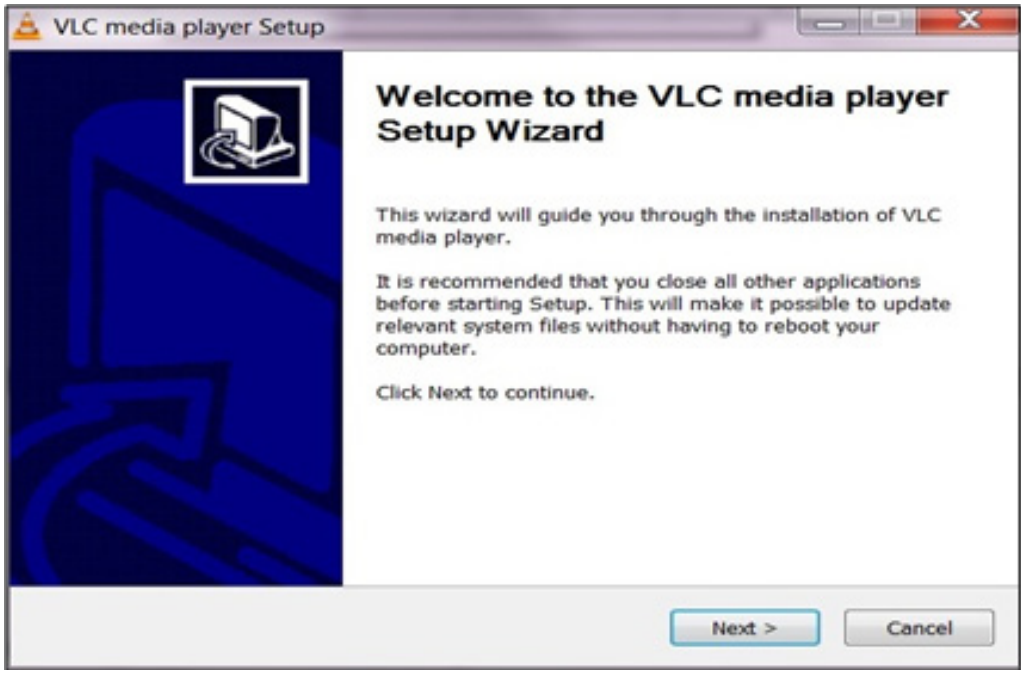
Step 6 – Go back to the **VLC** folder.

Step 7 – Double click on the version (32 bit or 64 bit) that is suitable for your computer to begin installation.

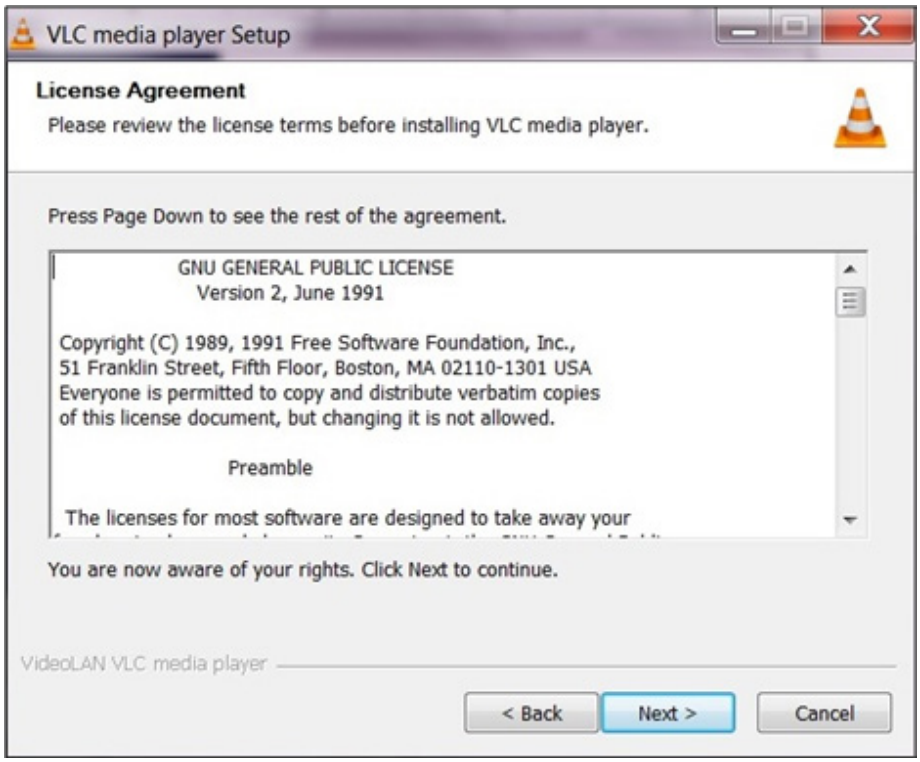


Step 8 – Select **English** by clicking on the small arrow and click **OK**.

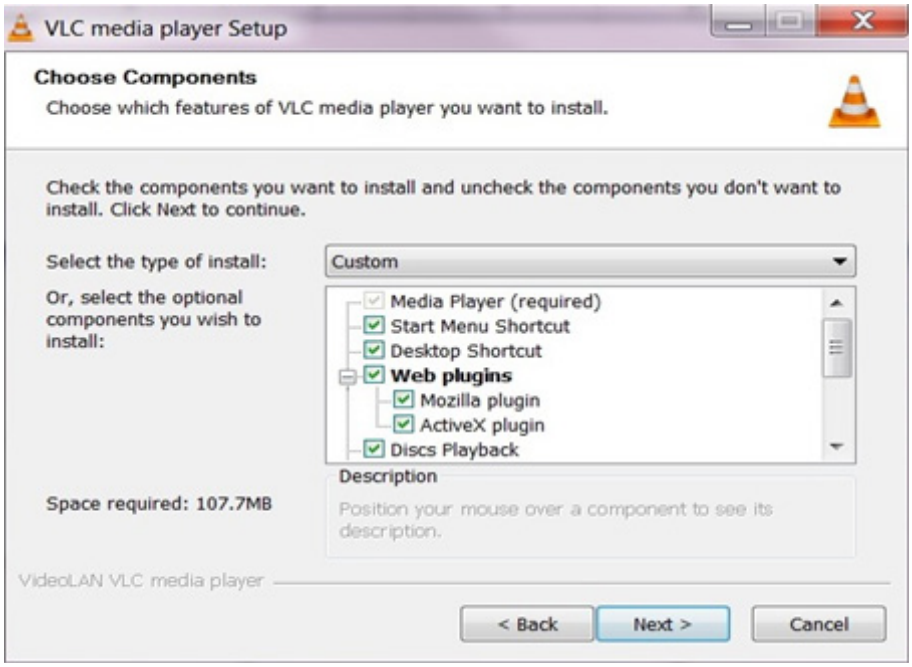
Step 9 – Once the Setup Wizard appears, click **Next**.



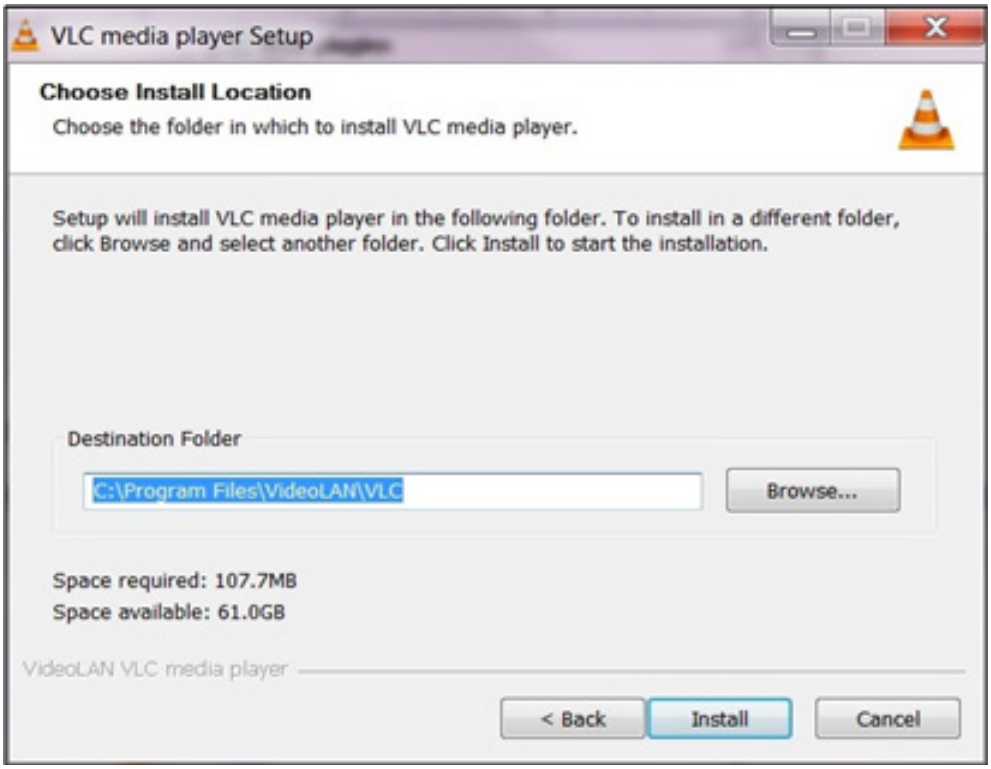
Step 10 – For the License Agreement, click **Next** again.



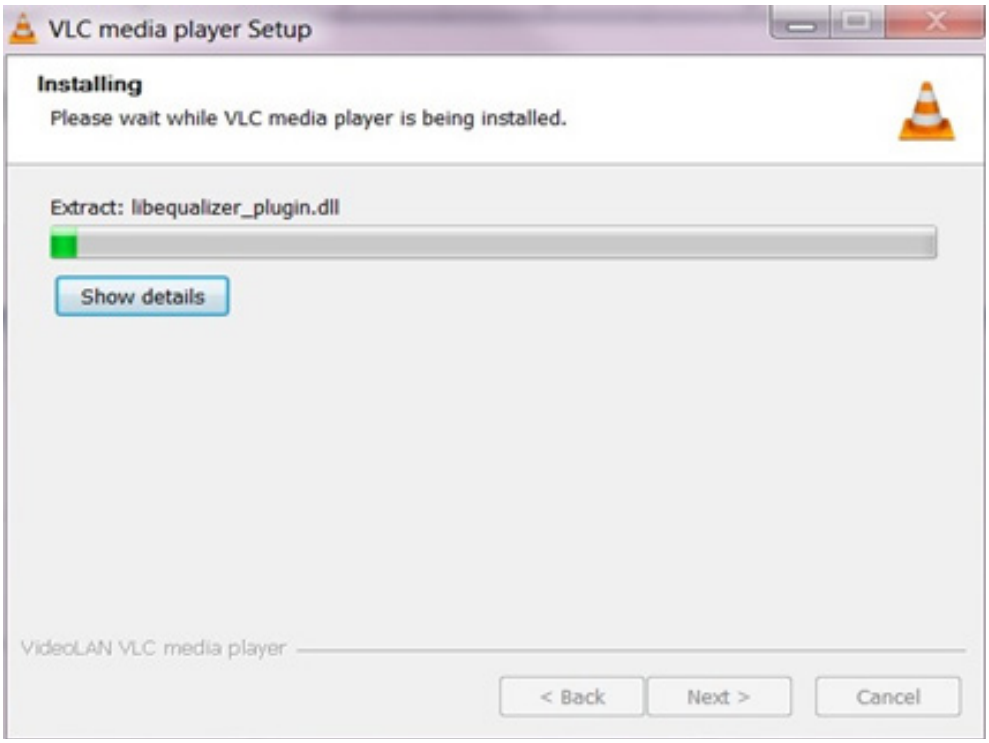
Step 11 – Click **Next.**



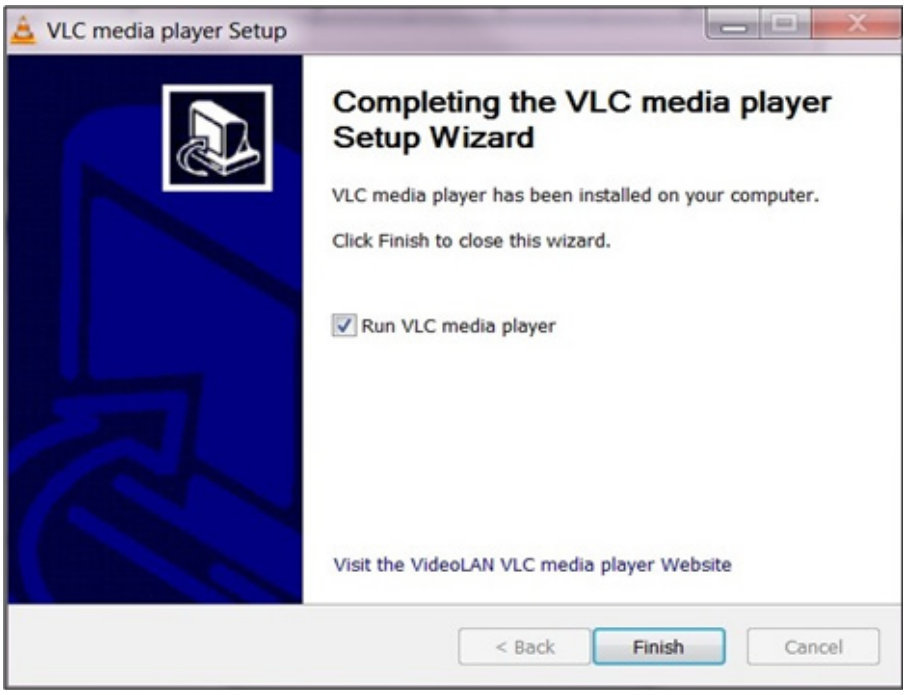
Step 12 – Click **Install.**



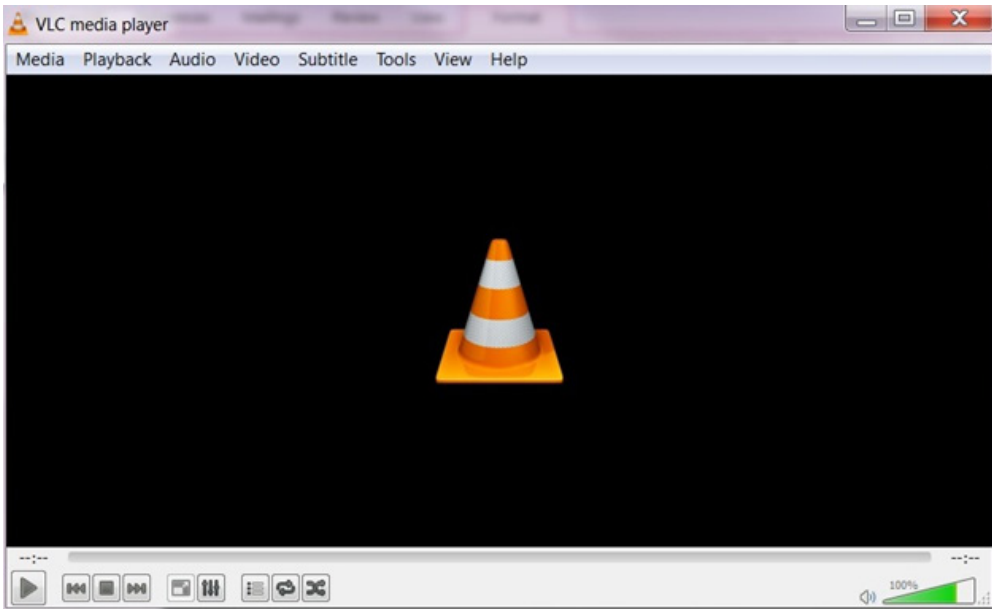
Step 13 – Wait for the installation to run.



Step 14 – Once the installation is complete, click **Finish.**



- You should now be able to see the VLC media player where you will be able to view the videos in this toolkit.



- Go ahead and close VLC. You will notice that there is a VLC shortcut on your desktop now. At any time you want to open the VLC media player you can double click on the shortcut on your desktop.

Step 15 – Go ahead and double click on the VLC media player shortcut as shown above to open it to see it. You may now close it. Chapter 4 will guide you on installing Apache Open Office onto your computer.

Congratulations

You have successfully installed VLC onto your computer.

Chapter 4 – Installing Apache Open Office

Objectives:

By the end of this Chapter, you should be able to:

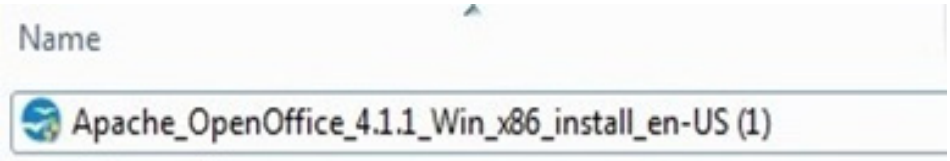
- Install Apache Open Office onto your computer.

Apache OpenOffice is a free version of Microsoft Office. This means that it works exactly like Microsoft the only difference is it is **free. Working with QGIS will require that your data needs to be in a tabular format. Therefore, Open Office is provided as a backup in case you face problems with Microsoft Excel or do not have it.*

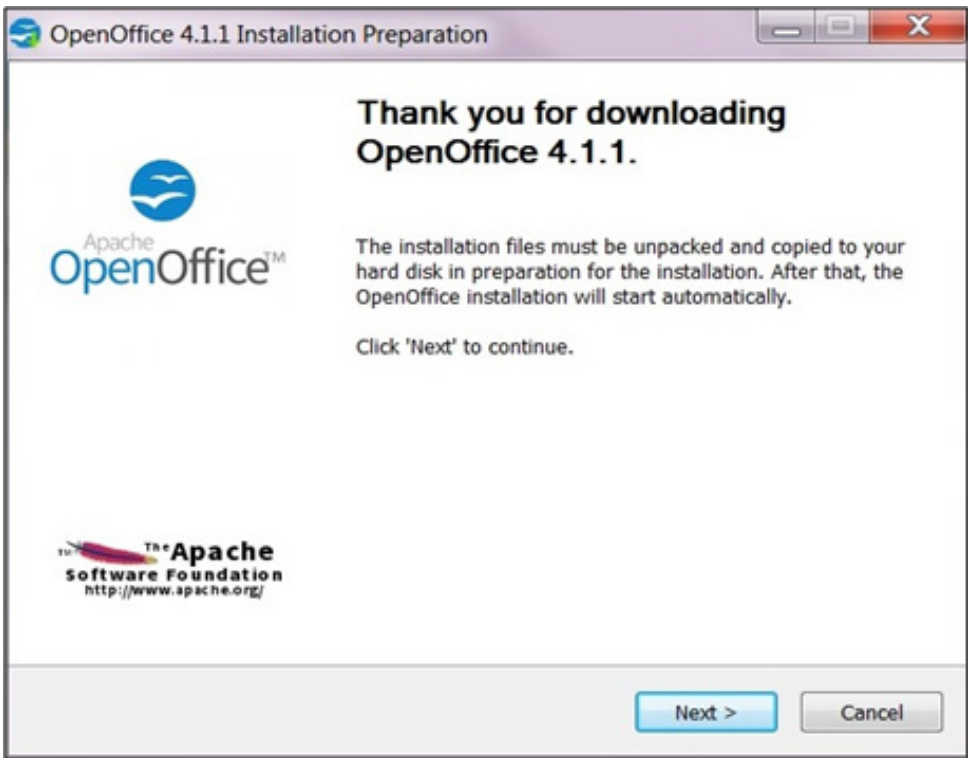
If you have **Microsoft Excel on your computer then you can choose to install OpenOffice or not. If you wish to install OpenOffice continue on to **Step 1**, otherwise you can skip to **Chapter 5.***

Step 1 – Go to the Community Mapping Toolkit folder and open the **Apache OpenOffice** folder.

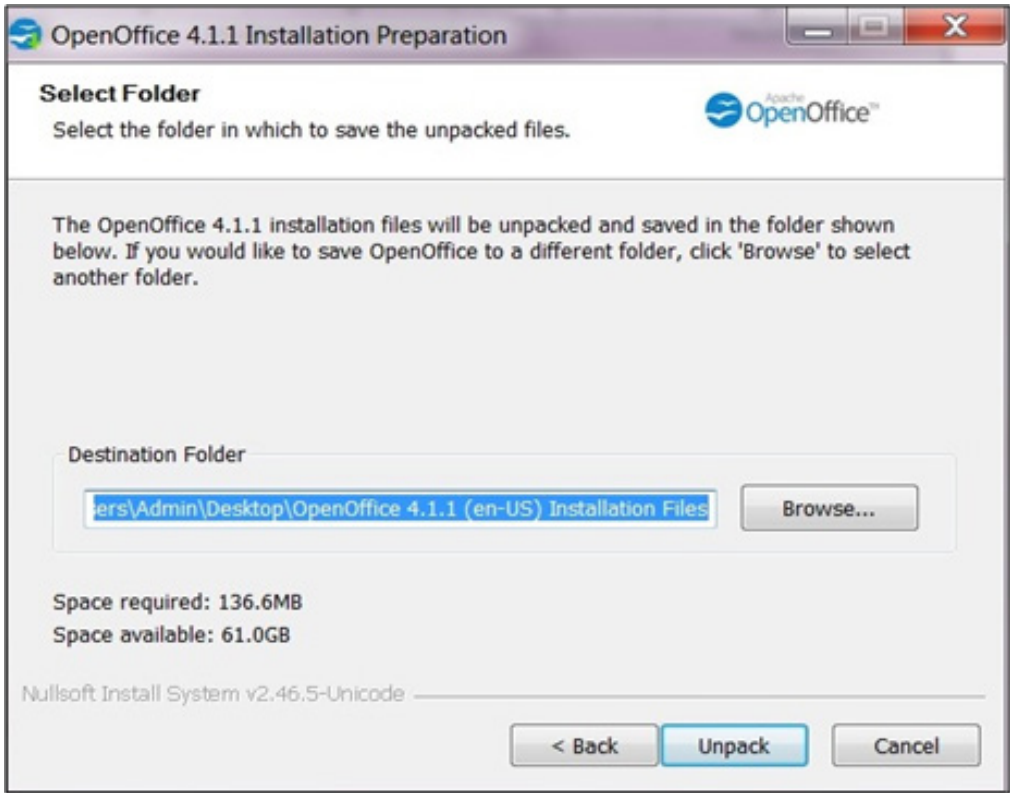
Step 2 – Double click on the **Apache OpenOffice** application to install it on to your computer.



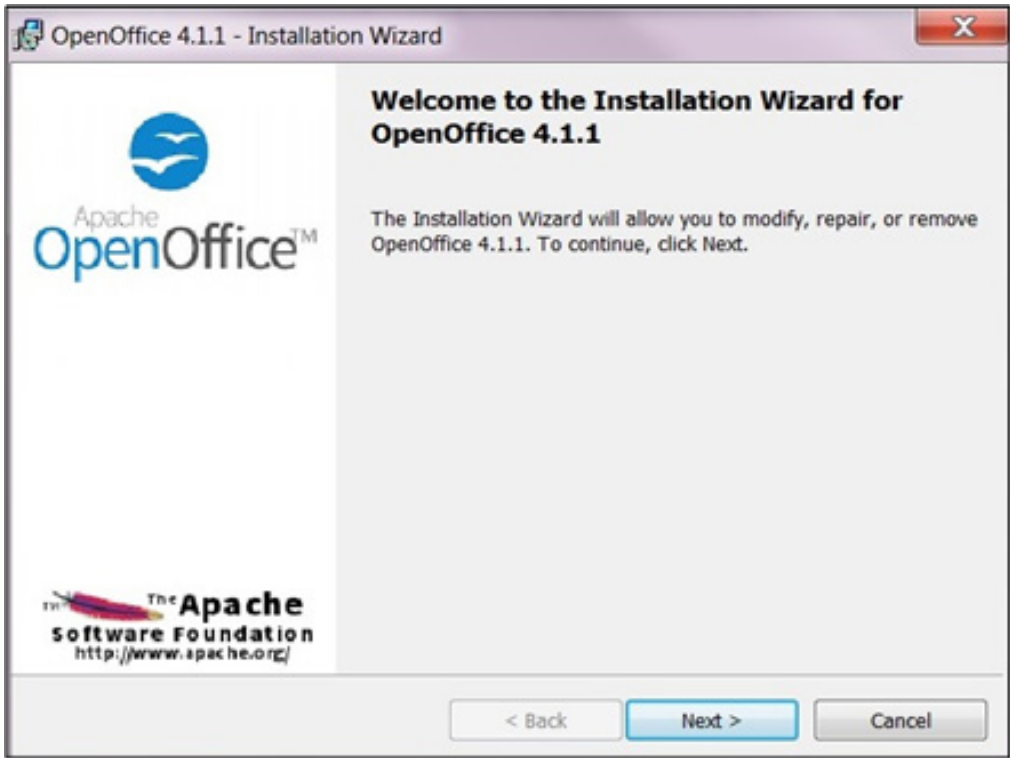
Step 3 – Once you double click on the icon, the **Installation Wizard** window will appear as shown below. **Click Next**.



Step 4 – Click **Unpack**.

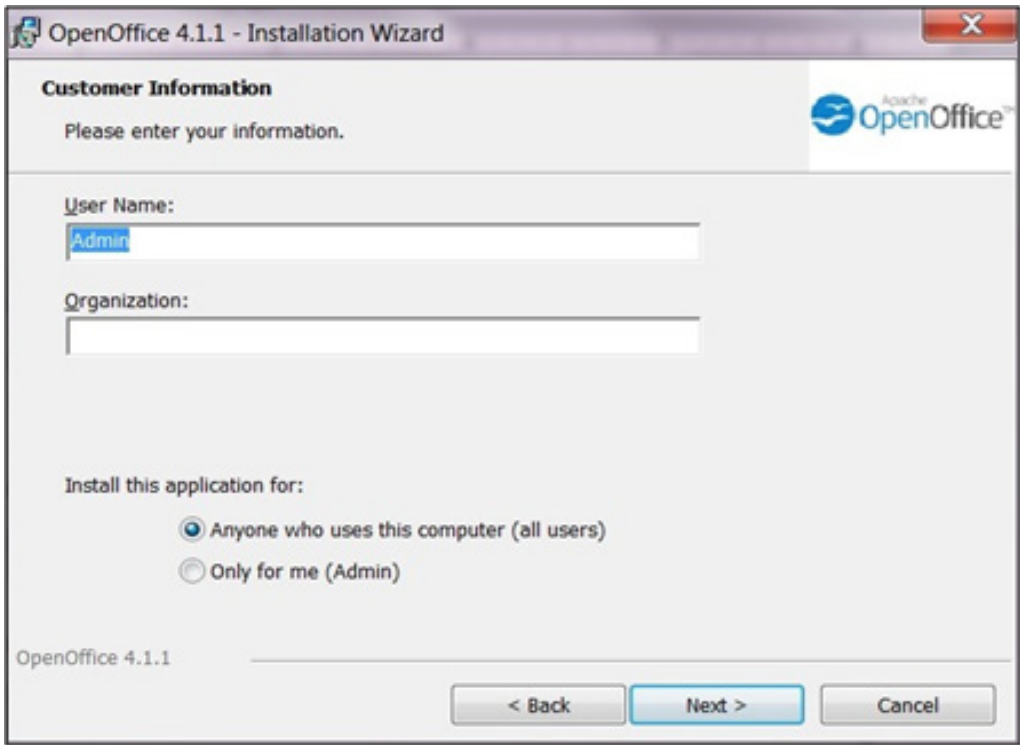


Step 5 – Click **Next**.



Step 6 – If the computer that you are using is your own, type your name where it says **User Name**. If the computer does not belong to you, you can leave it as it is.

Step 7 – Click **Next.**

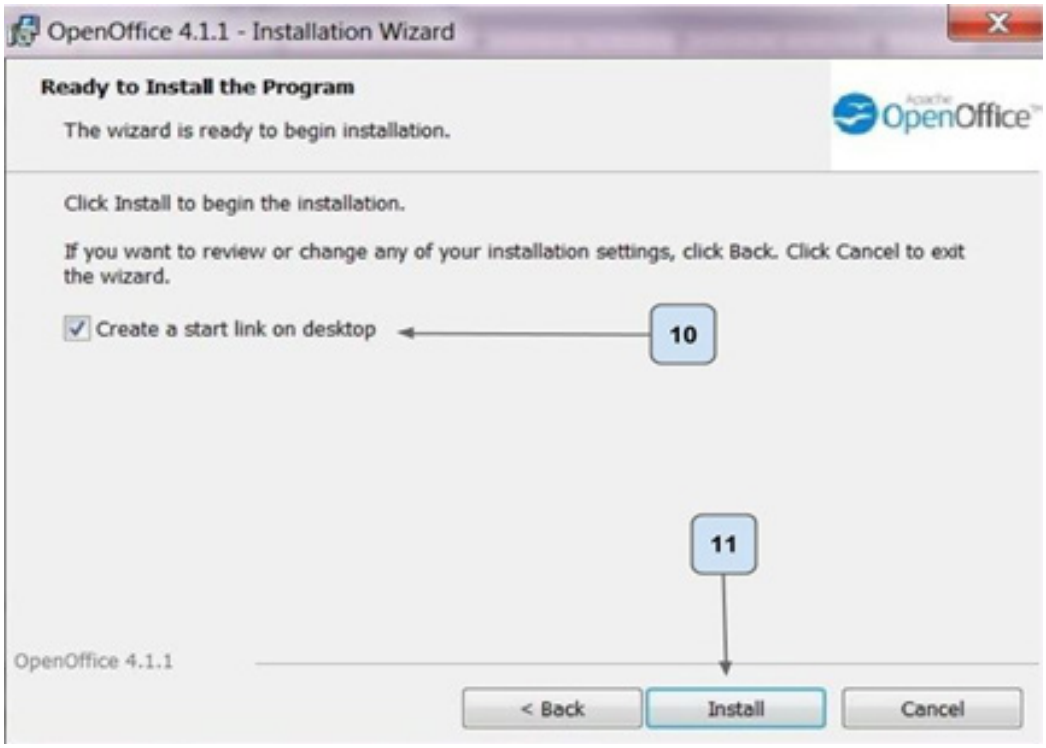


Step 8 – For the **Setup Type**, click on the small circle beside **Typical** to select it. This is the recommended setup.

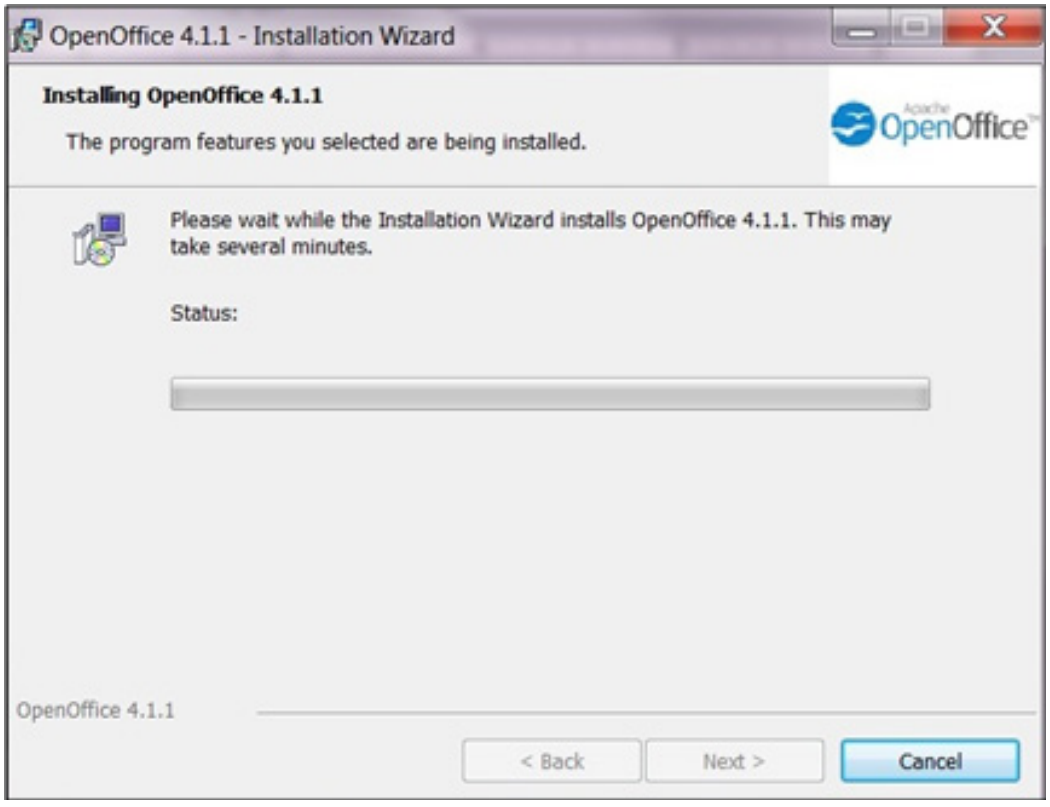
Step 9 – Click **Next.**

Step 10 – Check the box next to **Create a start link on desktop**.
**This will create a shortcut on your desktop, see step 13.*

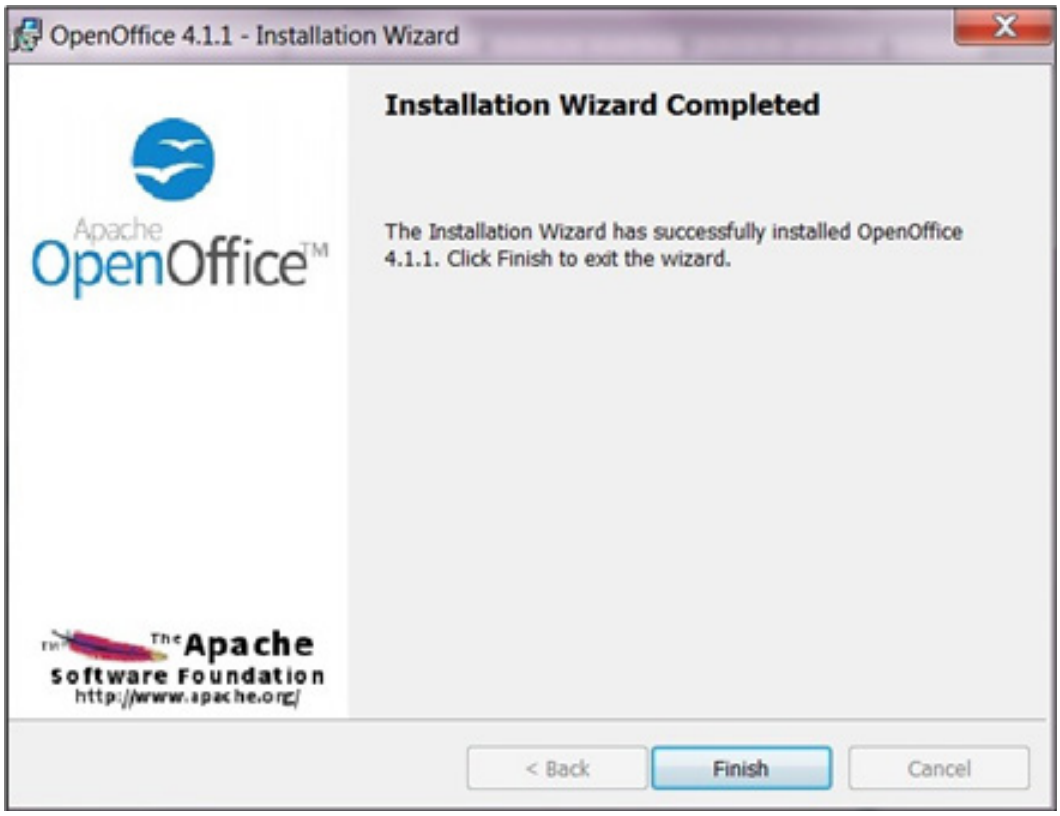
Step 11 – Click **Install.**



- Now the **Apache OpenOffice** software will begin installation. The window below lets you see whether the installation is complete.



Step 12 – Once the installation is completed, click **Finish**.



- You should now be able to see the OpenOffice shortcut on your desktop (see image below). Anytime you wish to use OpenOffice, you can double click on this shortcut.

Step 13 – Double click on it to open it.

Step 14 – The **Welcome to OpenOffice** window will appear. Click **Next.**

Step 15 – Type in your **First and Last name**.
*You only need to do this once.

The **OpenOffice interface will appear as shown on next page. You will be using the **Text Document and the Spreadsheet** a lot. However, you can experiment with the other OpenOffice programs.*

- **Chapter 5 will guide you on installing QuantumGIS (QGIS).**

Congratulations

You have successfully installed OpenOffice 4.1.1 onto your computer.

Chapter 5 – Installing QGIS 2.8

Objectives:

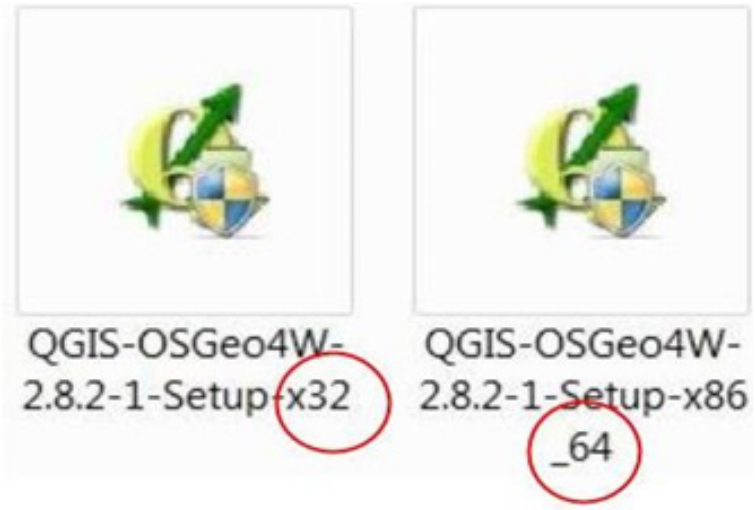
By the end of this Chapter, you should be able to:

- Install the correct version of QGIS onto your computer.

QGIS 2.8 *is the latest version of the QGIS software at the time of this publication*

Step 1 – Go to the **Community Mapping Tool-kit** folder.

Step 2 – Double click on the **QGIS Setup** folder to open it. You will see that there are two versions (64 bit and 32 bit) of the QGIS software (see image below). One of these two versions is the setup suitable for your computer.



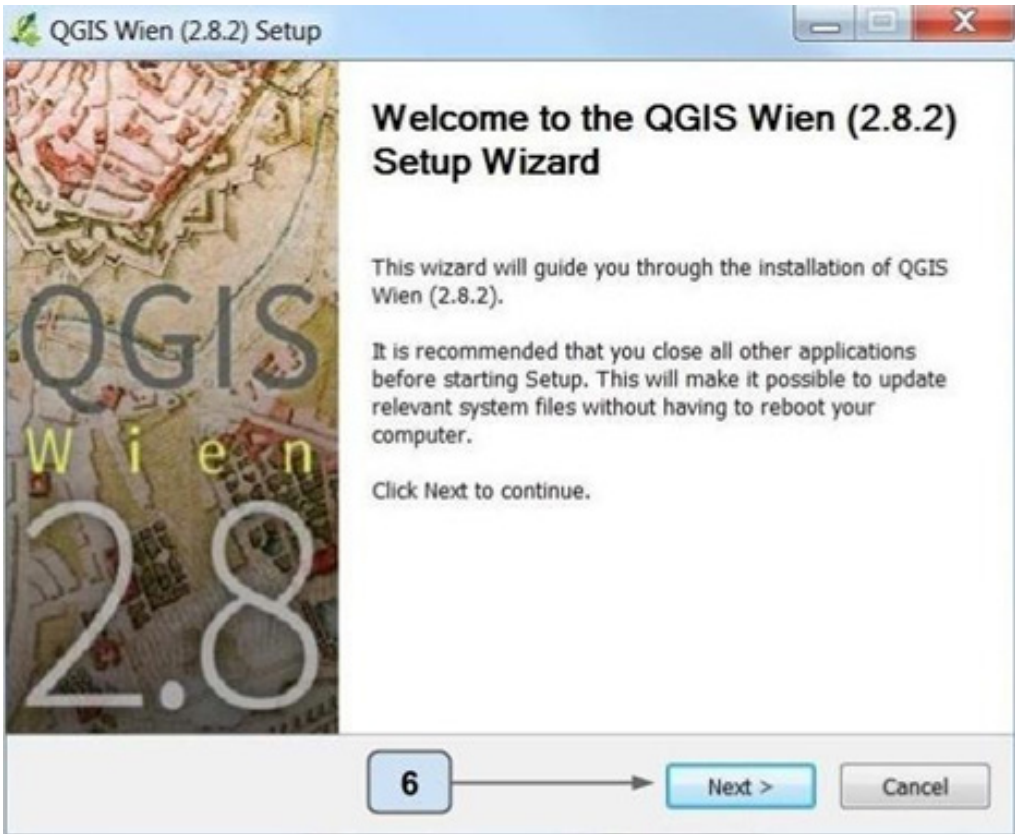
You learned in Chapter 3 whether your computer is a 32 bit or a 64 bit. If you remember this double click on the version suitable for your computer. Otherwise refer to Chapter 3 and follow the instructions to find out whether your computer is a 32 or 64 bit and to know which version is suitable for your computer.

Step 3 – Once you know the system type. Close this window.

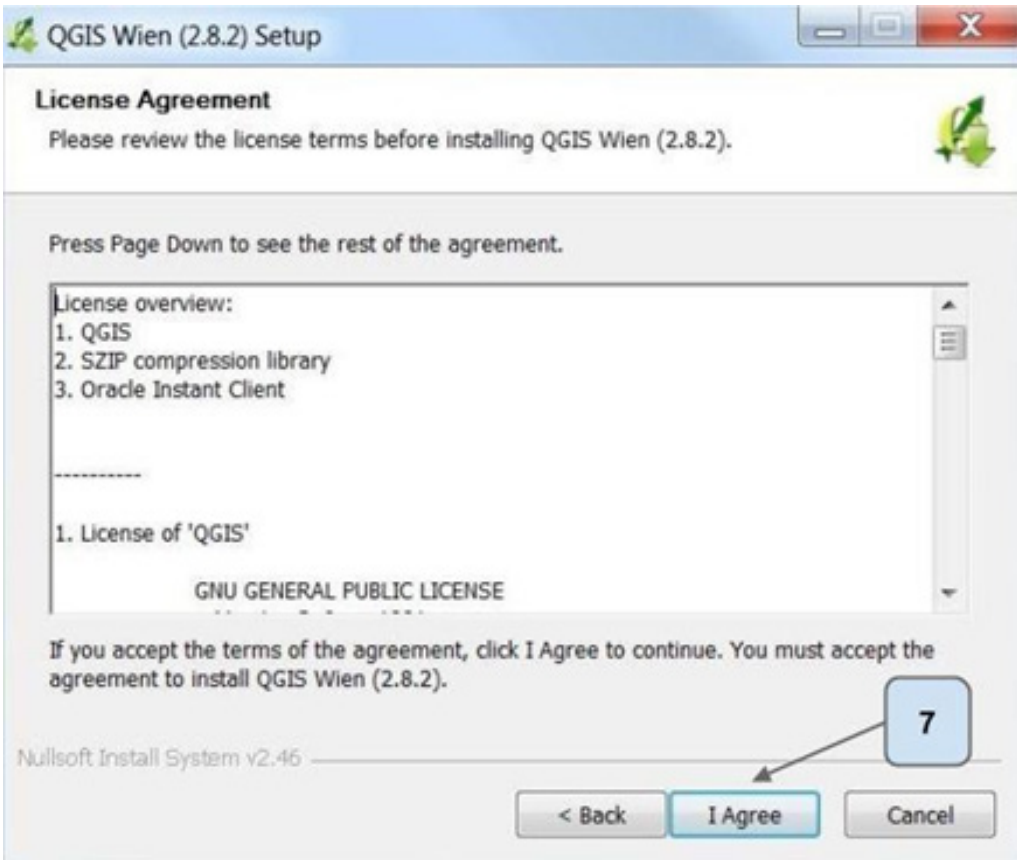
Step 4 – Go back to the folder where the **QGIS setup** is.

Step 5 – Double click on the version (32 or 64) that is suitable for your computer to install it.

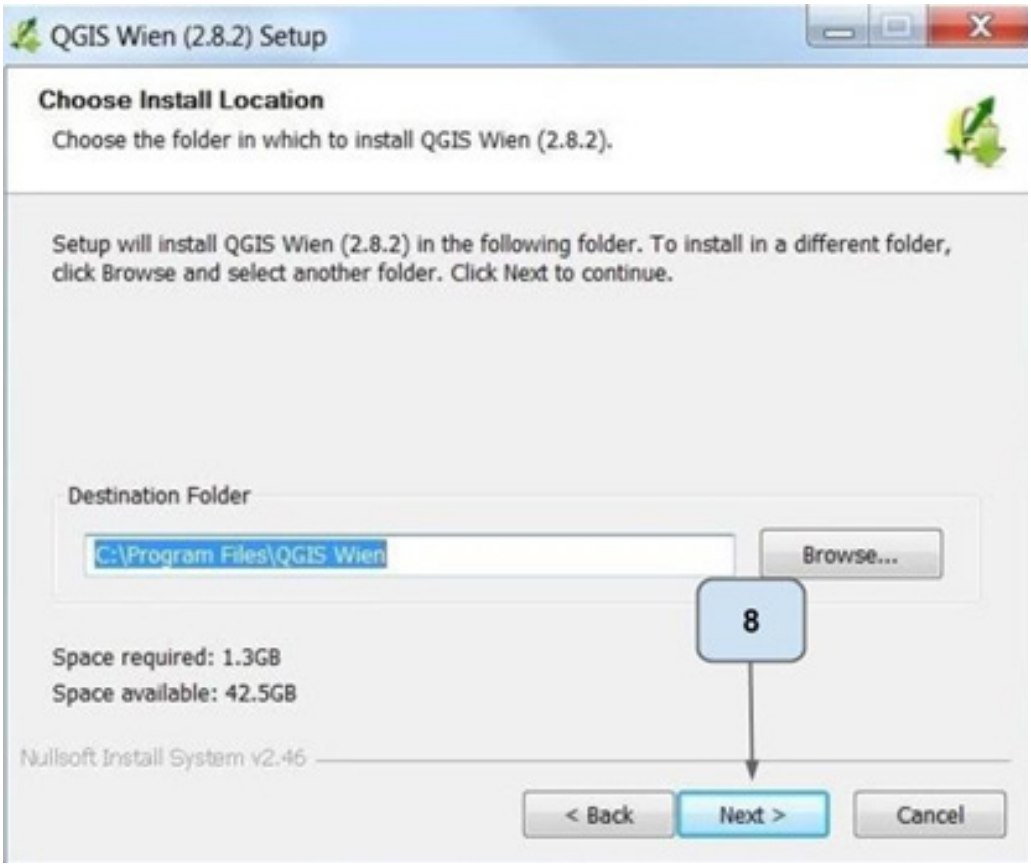
Step 6 – The QGIS setup wizard will then pop up. **Click Next**.



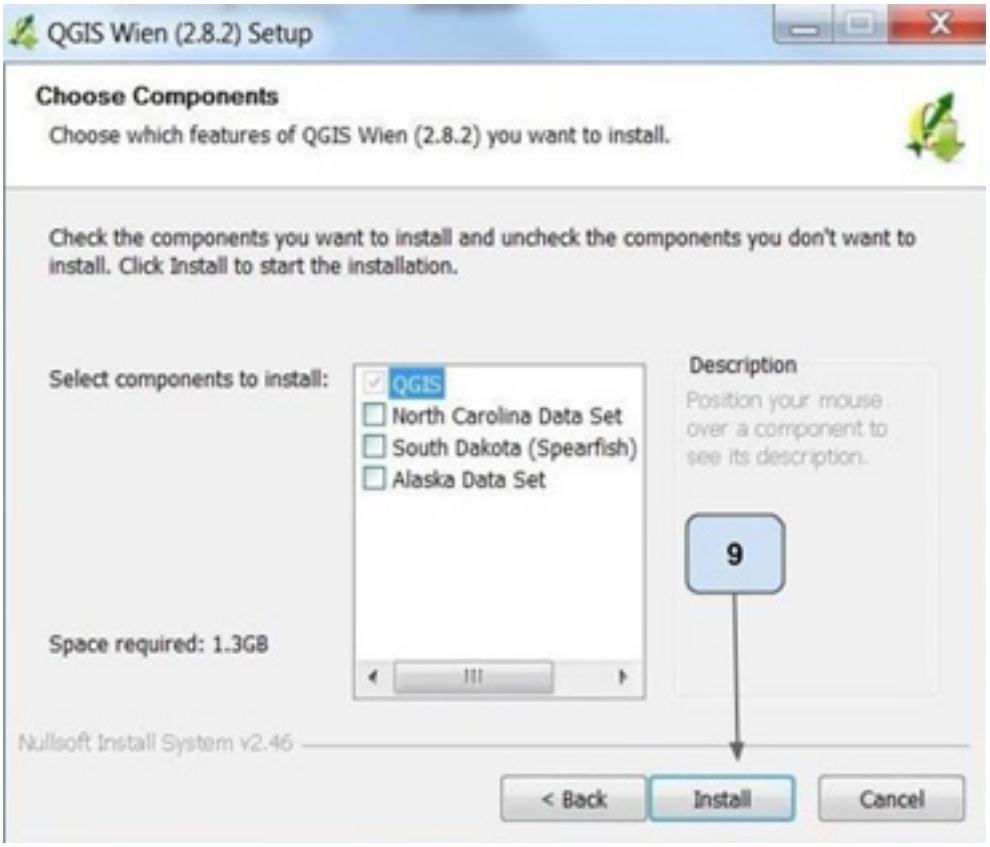
Step 7 – Click **I Agree**



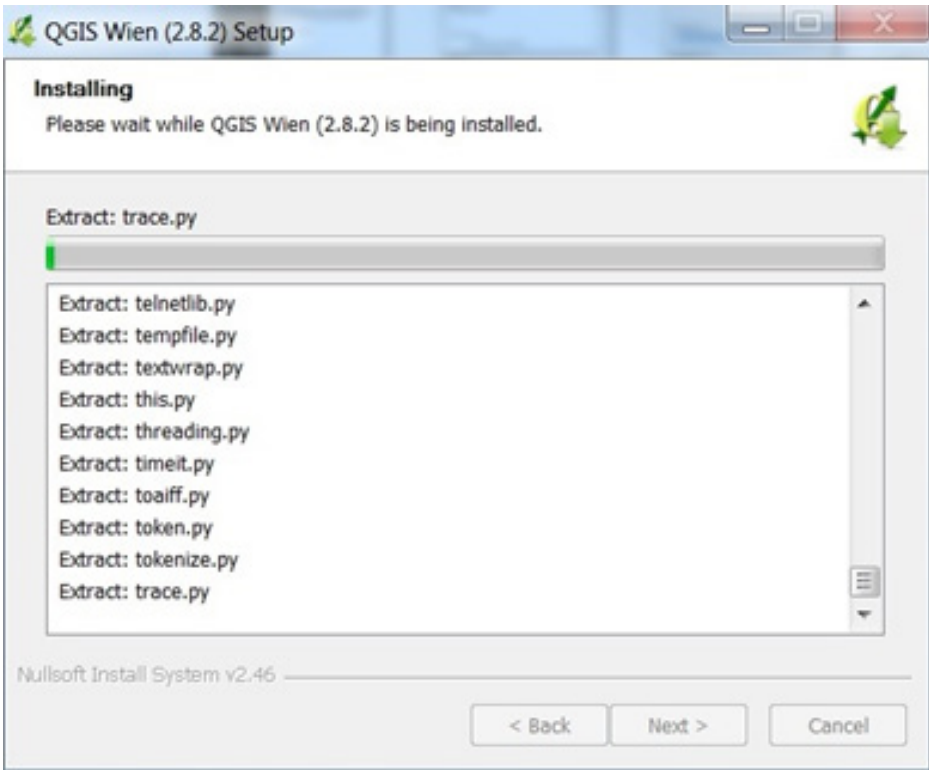
Step 8 – Click **Next.**



Step 9 – Click **Install.**



Step 10 – Wait for the installation to complete.



Step 11 – Once the installation is complete, click **Finish**.

Congratulations

You have now successfully installed QGIS onto your computer. Chapter 6 will guide you on how to use Apache OpenOffice.

Chapter 6 – Getting started with Open Office and Spreadsheet tables

Objectives:

By the end of this Chapter, you should be able to:

- Create a text document in ApacheOpen Office.
- Organize data into a Spreadsheet in ApacheOpen Office.
- Enter, delete, edit and save data on a Spreadsheet.

**Only attempt this chapter if you do not know how to write a text document or have not used Microsoft word and excel.*

You will need to learn how to organize your data in tables so that you can use it in the QGIS software. It also makes it easier for other people to use the data that you will collect, edit and store. In this Chapter, you will learn how to create a text document so that you are able to create a text document when you create your action plan. A text document is very useful especially if you want to write a report about your community or write a formal letter. You will also learn how to organize data in a Spreadsheet table.

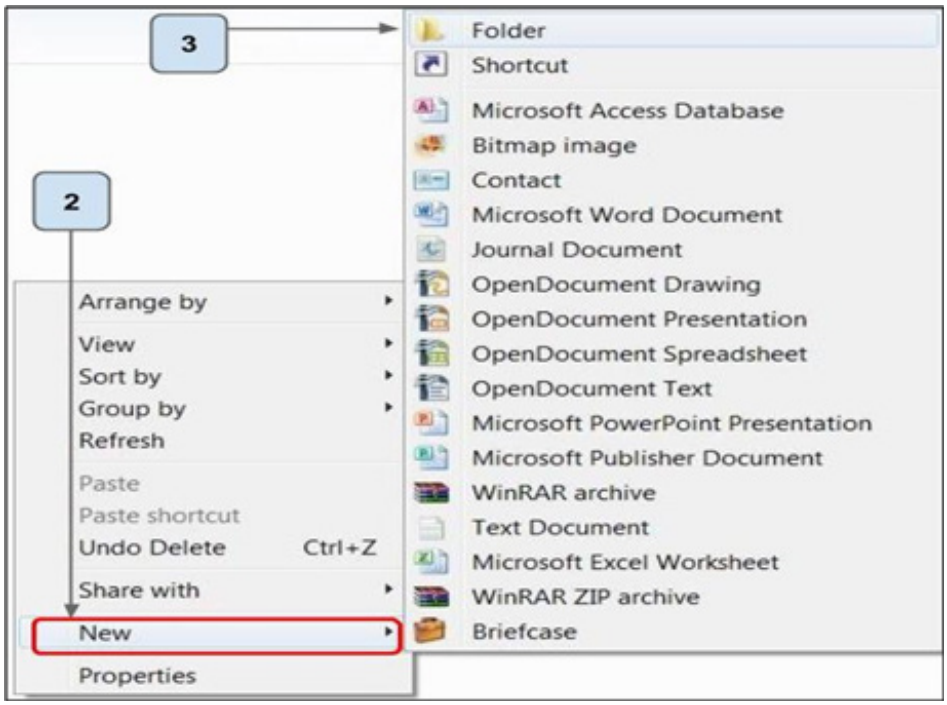
6. 1 Open Office

**Before you create your document, you need to create a folder so that you can save the document in it. This way, your work is more organized and then you know exactly where to look for your documents.*

Step 1 – Go to your document folder and create a new folder and name it **Test**.

Step 2 – In your Document folder, right click on any empty space and select **New**.

Step 3 – Select **Folder**.



Step 4 – Name the new folder **Test** and then close the Document window.

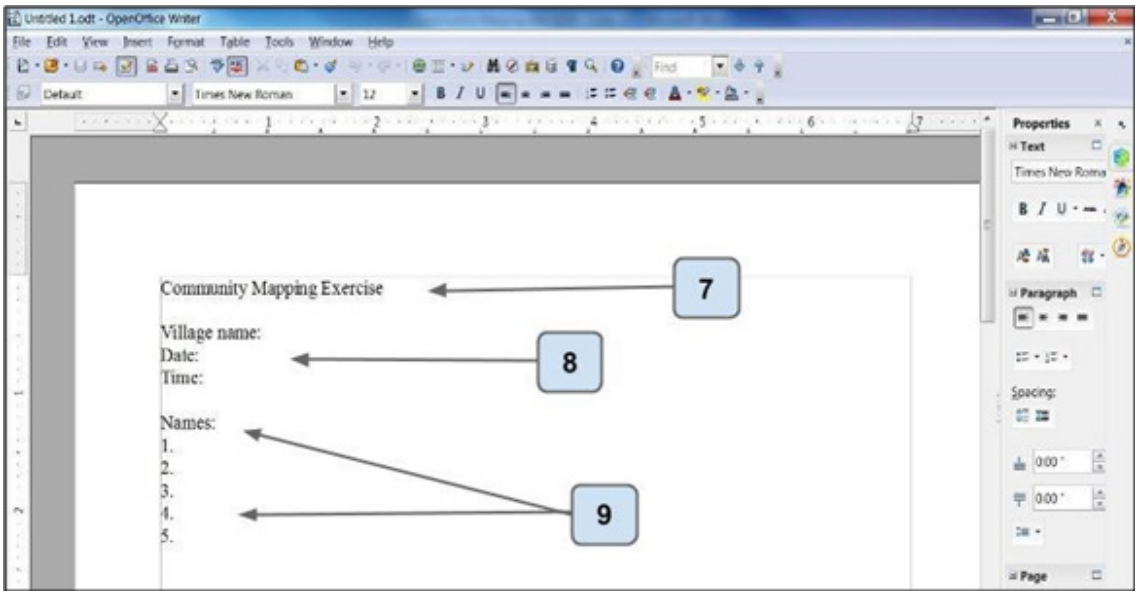
Step 5 – On your desktop, double click on the OpenOffice shortcut to start it.

Step 6 – Click on the **Text Document** to open it.

Step 7 – Once the window is open, click in the middle and type **Community Mapping Exercise.**

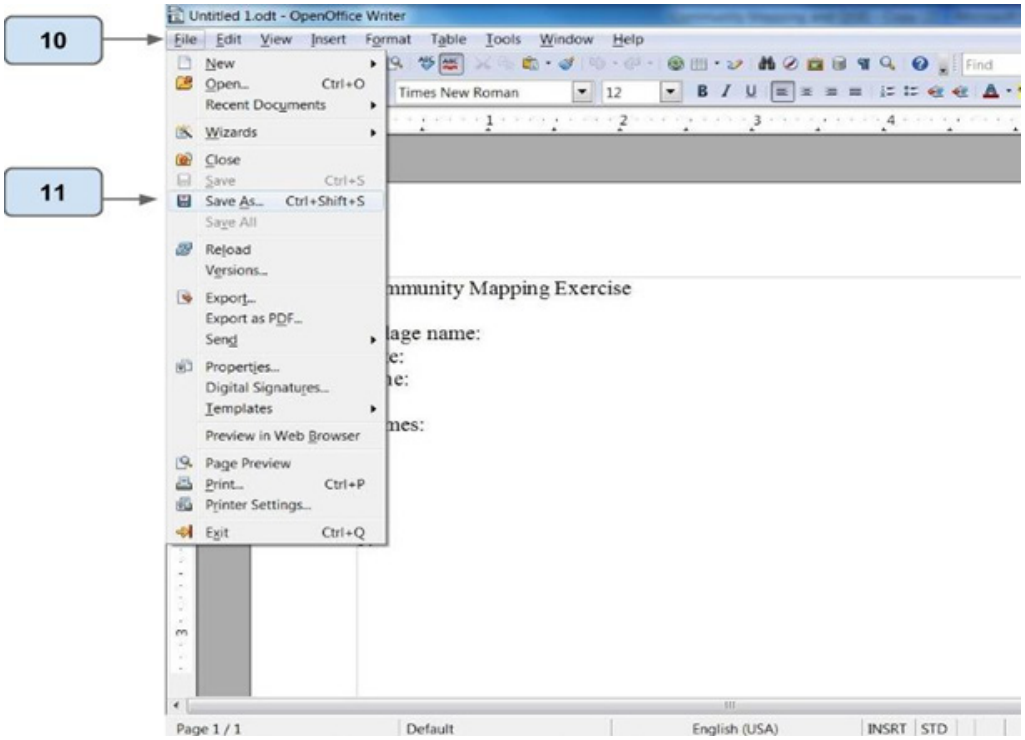
Step 8 – Type the name of your village, the date and time.

Step 9 – Type in the name of everyone in your family. See example below.



Step 10 – Now we are going to save your document. Go to **File**.

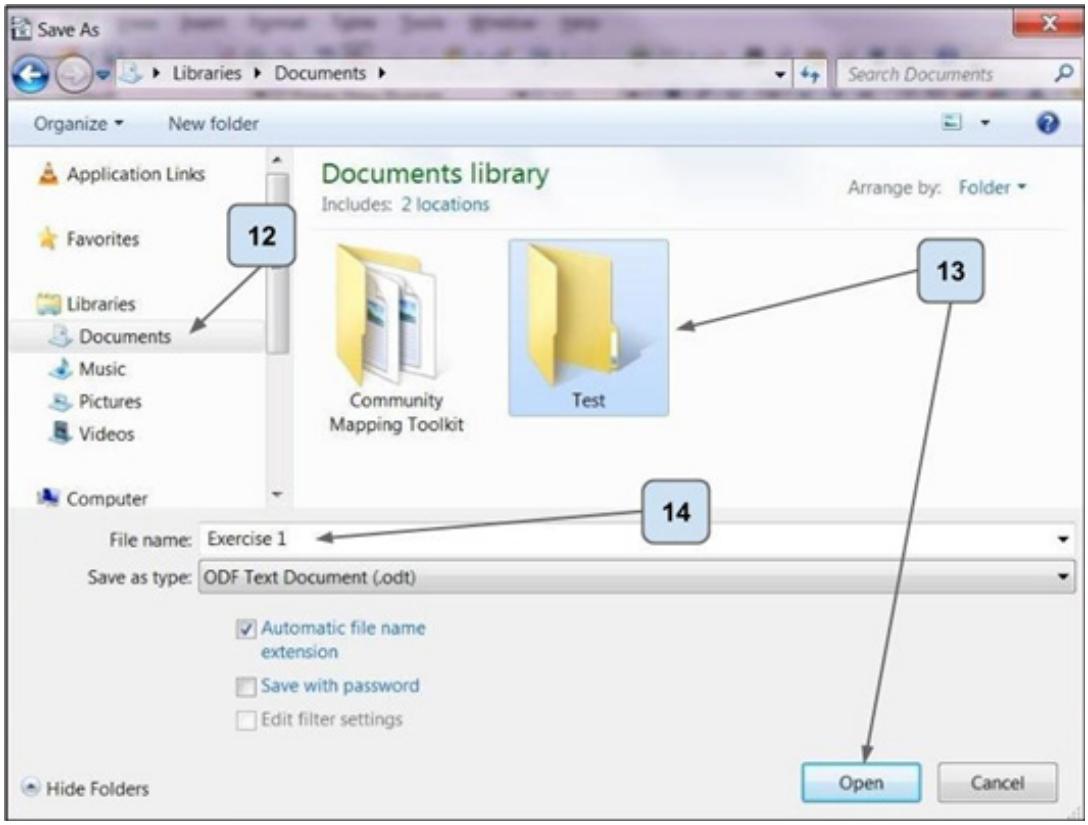
Step 11 – Click **Save As**.



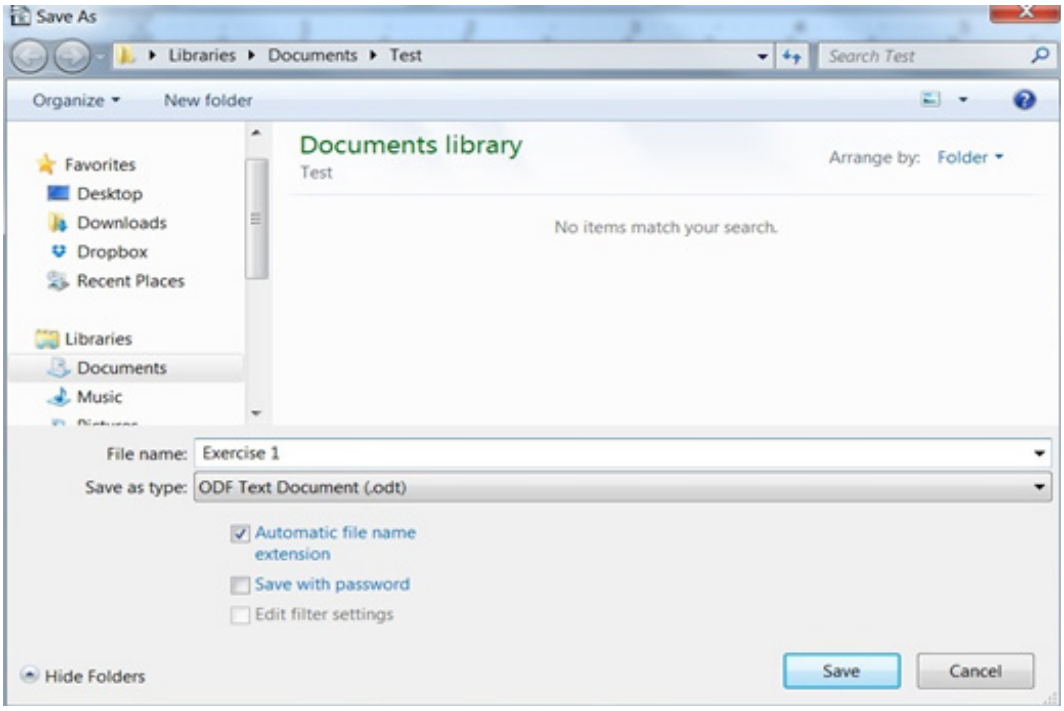
Step 12 – Once the **Save As** window appears, click on the **Documents** tab.

Step 13 – Click on the **Test** folder and select **Open**.

S**tep 14** – Name the file **Exercise 1**



Step 15 – Click **Save.**



Step 16 – Close the Text Document.

Step 17 – Go to your **Documents** folder and check whether your Text document was saved properly. Look for the name of your document which is **Exercise 1**.

Step 18 – Go ahead and close this window.

In mapping, most of the information and data that you will collect from your community will be recorded in tables. The definition of data that we will use for this mapping toolkit is simply **information, facts, statistic and description of your community that will be collected, organized and stored**.

When you go out to collect data, you will need to record it first on a piece of paper. The best way is to have a table to make it more organized. Not only will it be more organized, but this is a good way to store and keep the information in your community and use it with the mapping software.

The Spreadsheet is a very powerful tool that allows you to **store data, calculate** and **create graphs**. Let's look at how we can store data in a table. You will be using Spreadsheet a lot so it is important that you have a basic understanding on how it works and what you can do with it.

**Note that if you have Microsoft Excel, you can use it as well. Apache Open Office has the same functions as Microsoft Excel. If you have Microsoft Excel and prefer to use it go to Chapter 6 Part 2. Open Office is provided in case you have difficulties with Microsoft Excel as a backup.*

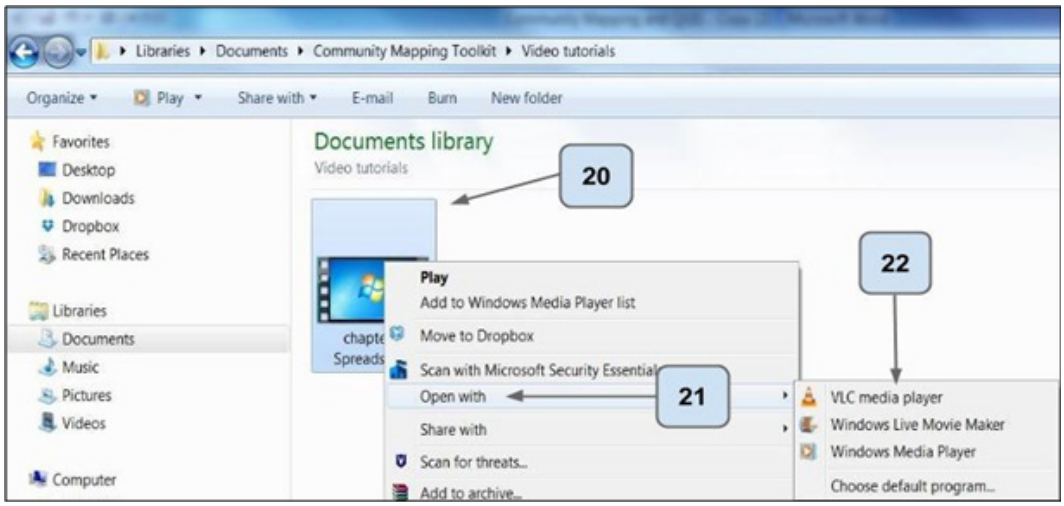
Let's look at the Spreadsheet in detail

Step 19 – To watch the video tutorial for this session, go to your **Community Mapping Toolkit folder**, and open the **Video tutorials** folder.

Step 20 – Right click on the video labelled **Chapter 6 Spreadsheet**.

Step 21 – Click **Open with**.

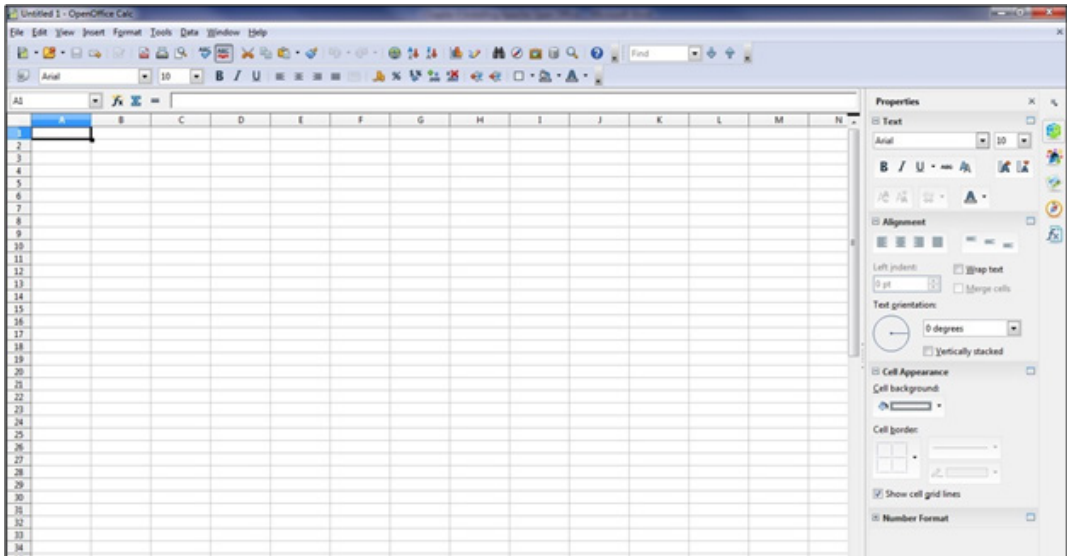
Step 22 – Select **VLC media player.**
**If you have another media player, you can open the video file with the media player you want.*



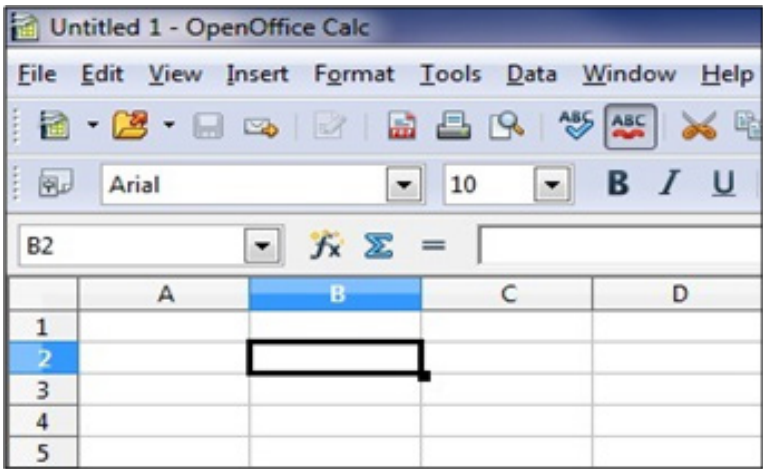
Step 23 – Once you have watched the Tutorial, go back to your desktop, click on **OpenOffice 4** to start it.

Step 24 – Click on **Spreadsheet** to open it.

Once **Apache Open Office Spreadsheet** has started, you will see that on the left hand side are numbers in **rows** and on the top are the **columns** in letters. These are called **coordinates**. Each rectangle on the spreadsheet is called a **cell**.



Step 25 – Click on the cell **B2**, see image below.
**Notice how Column B and Row 2 are highlighted in blue? Whenever you click on an empty cell, its coordinates will be highlighted in blue as shown below. So the coordinates for the highlighted cell is B2. This will help you know which cell you are working on*.



Step 26 – Now click on **A1** and type **ID**.
**In everything that you enter into excel that will be used for mapping, it is important that you give it an I.D number, you will learn more about this in chapter 10.*

Step 27 – Now click on **B1** and type in **TYPE**.

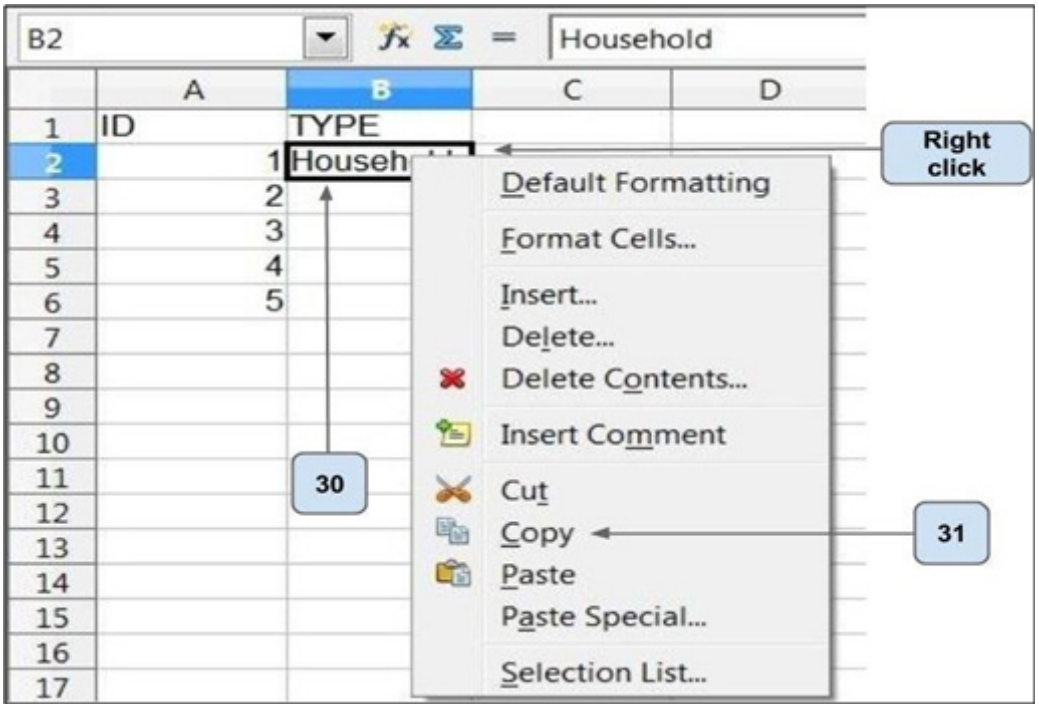
Step 28 – Enter 1-5 as shown below.

Step 29 – Under the column **TYPE**, enter **Household**.

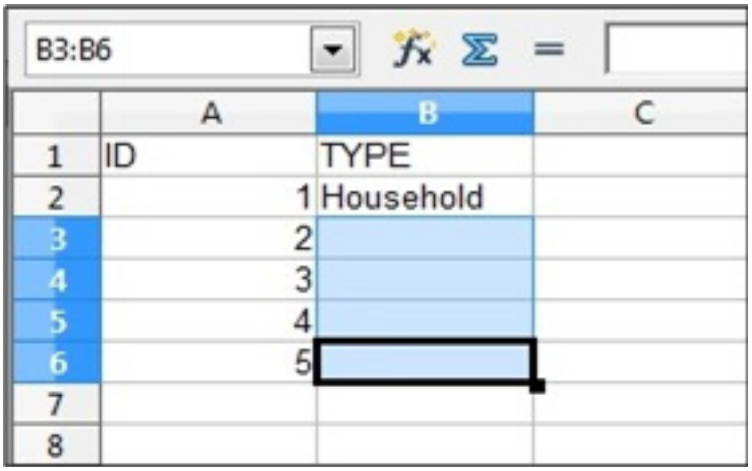
	A	B
1	ID	TYPE
2	1	Household
3	2	
4	3	
5	4	
6	5	
7		

Step 30 – Click on **Household**.

Step 31 – Right click and select **Copy**.

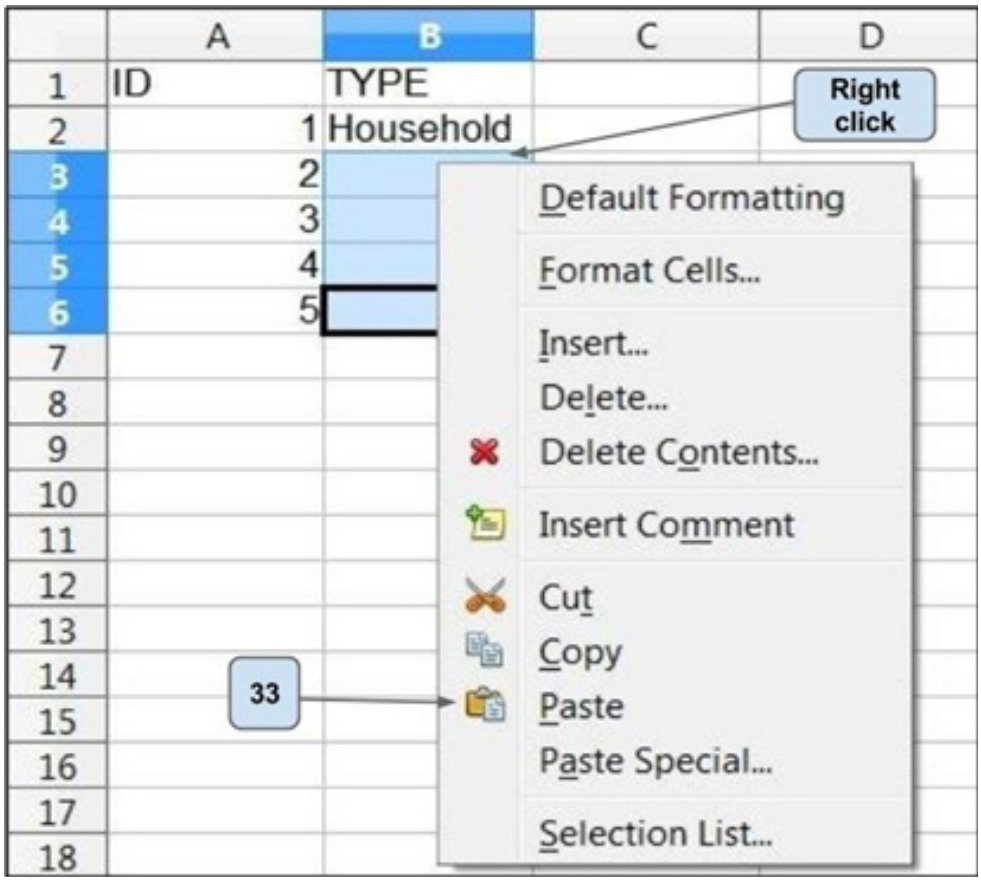


Step 32 – Click and hold the click on cell B3 and then drag the highlighted part all the way down to **B6**.

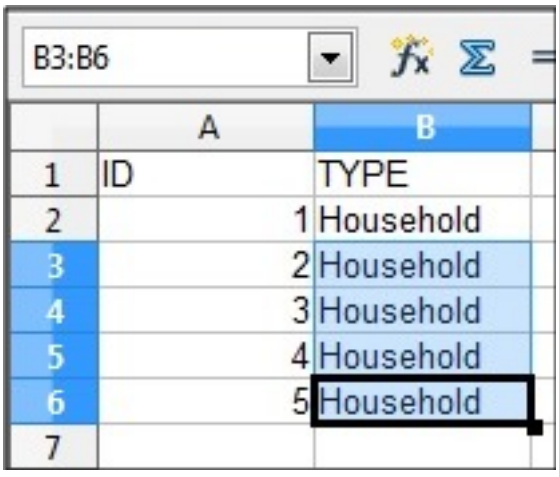


Notice how you have created a rectangle?

Step 33 – Right click in any part of the highlighted square and select **Paste**.



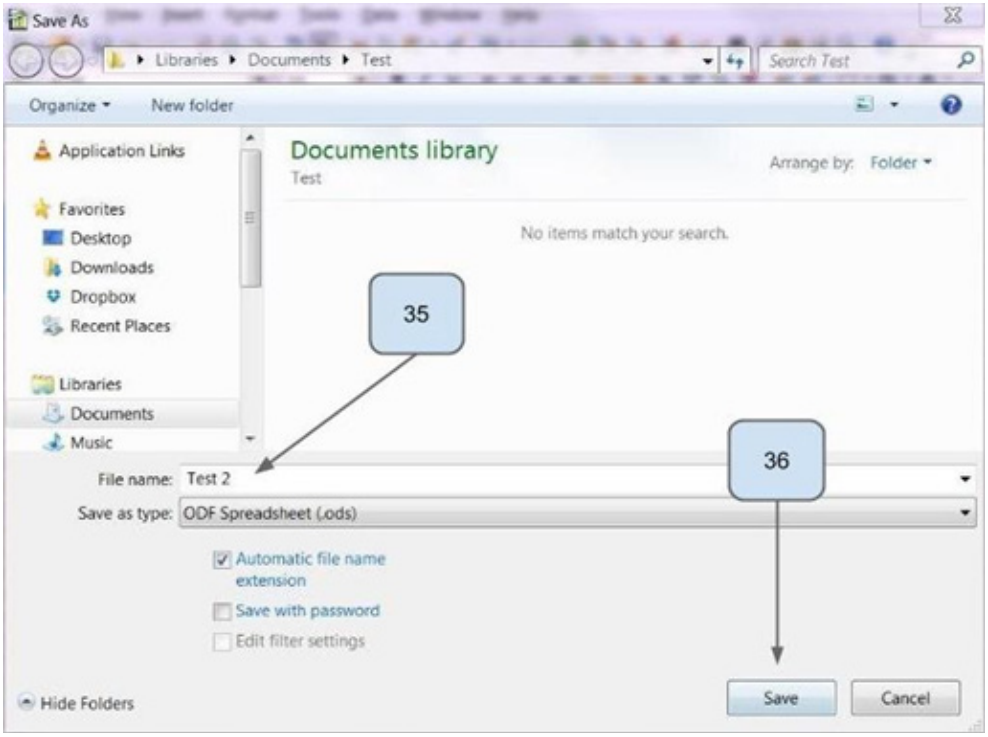
- Your table should now look like the image below.



- Now you will save your spreadsheet document.

Step 34 – Click on **File** on the upper left hand corner and click on **Save As**.

Step 35 – Once the **Save As** window appears click on the **Documents** folder under **Libraries**. Then save the spreadsheet document in the **Test** folder.



Step 36 – In the **File name** tab, type in **Test2** and click save then close then spreadsheet.

This means that you have named your Spreadsheet table **Test2** and it is saved in the **Test** folder in your **Documents**.

Congratulations

You have now successfully created a text document and a spreadsheet table and have saved it.

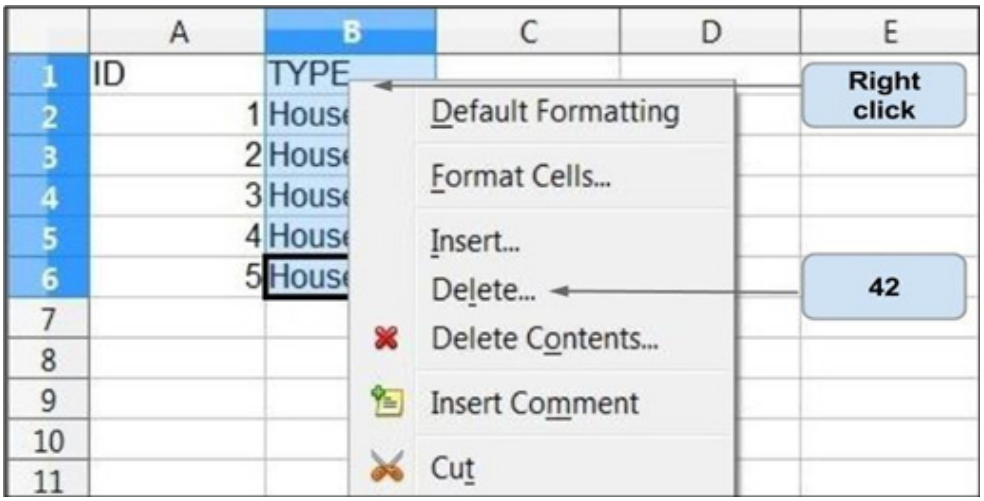
**Now we are going to check to see if you saved your document correctly.*

Step 39 – Go to the **Test** folder and look for the spreadsheet that have you just created with the name Test2.
**You will now edit the information on your Spreadsheet.*

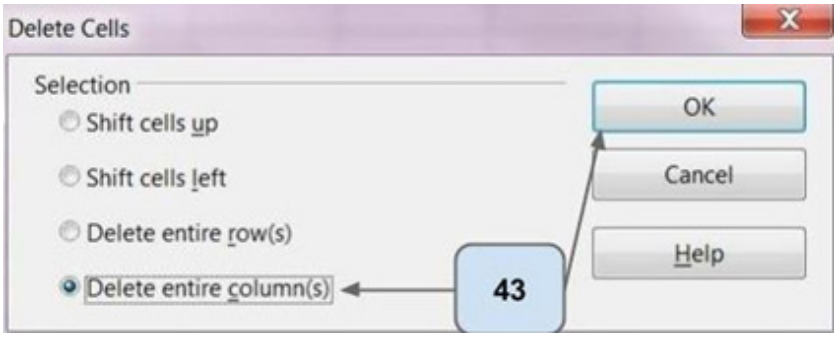
Step 40 – To open it, double click on the file **Test2**.

Step 41 – Click on the column B1 where it says **Type**. Hold the click and drag it down to Household number 5.

Step 42 – Right click and select **delete**.

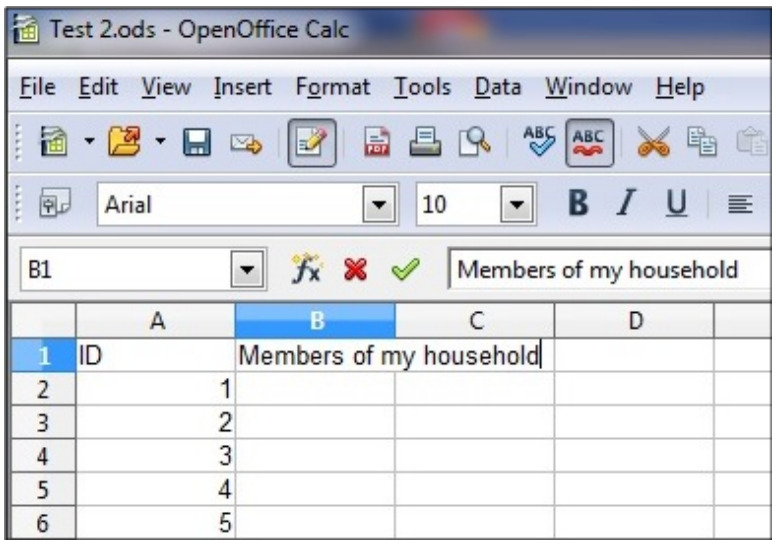


Step 43 – Select **Delete entire column(s)** and then click **OK**. (You want to delete the entire column, if you wanted to delete a row only, then you would have chosen Delete entire row(s)).



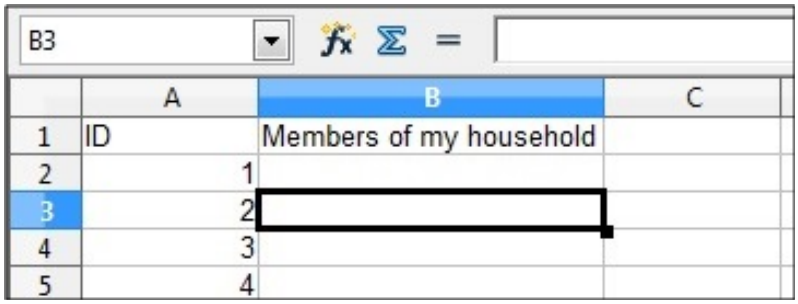
If you make a mistake you can always go to Edit on the top left hand corner and select **Undo. Now you will edit your information.*

Step 44 – Click on B1 and type **Members of my household** and then press Enter on your keyboard.



**Notice how your sentence does not fit only in the B column?*

Step 45 – Now, move your mouse over the headings column B and C until you see the icon with two black arrows pointing in opposite directions. Drag the end of column B to the right all the way until you see that everything fits in the column.



Step 46 – Click on C1 and type in **Age**.

Step 47 – Then click on D1 and type in **Occupation**.
Now that you have identified your **headings, you may now **enter all the members of your family, their age and occupation**. See example below.*

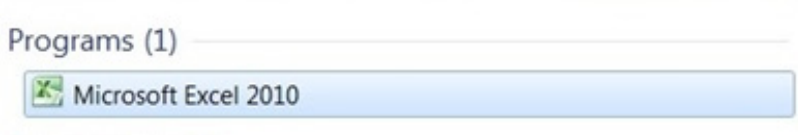
	A	B	C	D
1	ID	Members of my household	Age	Occupation
2	1	John	22	Student
3	2	Peter	48	Teacher
4	3	Mary	47	Housewife
5	4	Molly	5	None
6	5	Tim	2	None

Step 48 – Once you have entered all the information for your family, go to the top left hand corner of your screen and click on **File** and then click on **Save**.

Step 49 – Now you can close the Spreadsheet.
**Remember you can always open the document again because you have already saved it. When you organize your data to be mapped, you will need to enter it the same way you did with your spreadsheet.*

6. 2 Microsoft Excel

Step 1 – Start Microsoft Excel. *(If you don't see Microsoft Excel, click on start and search for it in the Search tab by typing in **Microsoft Excel**. In the list that appears click on Microsoft Excel under Programs, see image below)*



Step 2 – Follow the instructions in Chapter 6 Part 1, step 25-49.

Congratulations

You have now successfully learned how to enter, delete, edit and save useful information in an organized way in OpenOffice Spreadsheet. Chapter 7 will guide you on the use of QGIS

Chapter 7 – Getting started with QGIS

Objectives:

By the end of this Chapter, you should be able to:

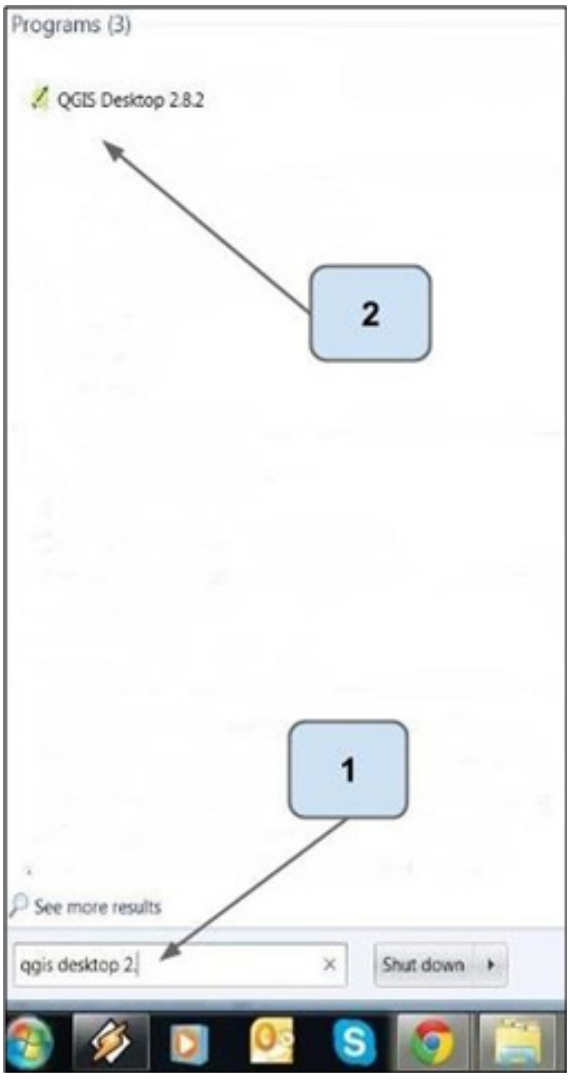
- Identify and understand the features of the QGIS interface.

The purpose of this chapter is to show you the features of QGIS. It provides images and simple explanation of what the main features of QGIS are and what you can do with it. Before you start mapping you need to know the features of the QGIS software.

**To watch a video for this chapter, open the video file named Chapter 7 QGIS Interface.*

Step 1 – Start QGIS. If the QGIS Desktop icon is on your desktop then double click on it to open it. If it is not on your desktop then go to Start and type in QGIS desktop 2.8 in the search tab and the QGIS software should appear at the top as shown below.

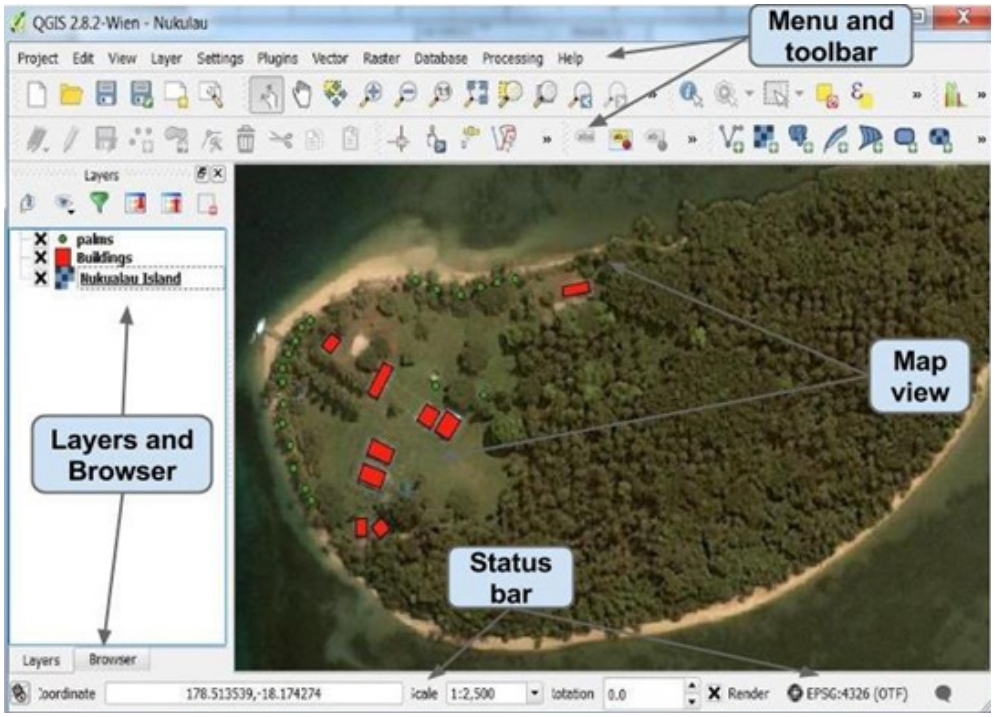
Step 2 – Double click on the **QGIS Desktop** to open it.



Step 3 – QGIS will open and begin to load.

Step 4 – Once the QGIS window appears, you are now ready to explore the QGIS window. The QGIS interface has four main sections. It is important that you know each one. We will explore each one briefly.

**Note that you will not see the image inside the map view as shown below. The image is provided here for example only.*



1.Menu bar

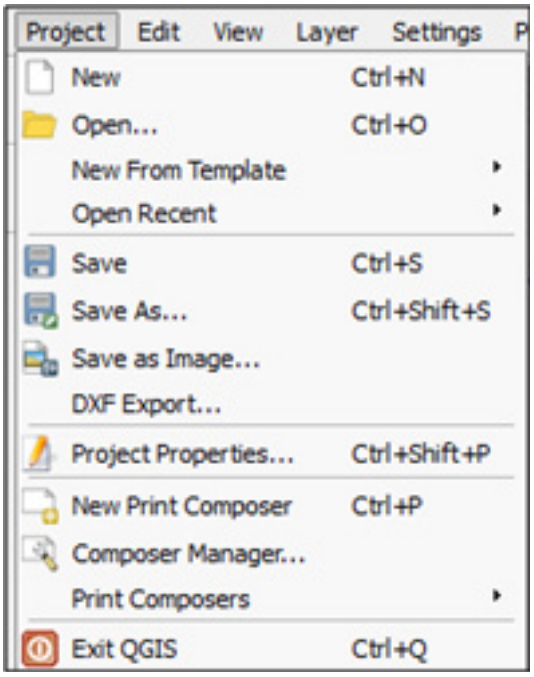
The QGIS menu bar gives you access to some of the QGIS features. Let's have a closer look at each tab to see the options that are available.

Project

Step 5 – Click on **Project**.

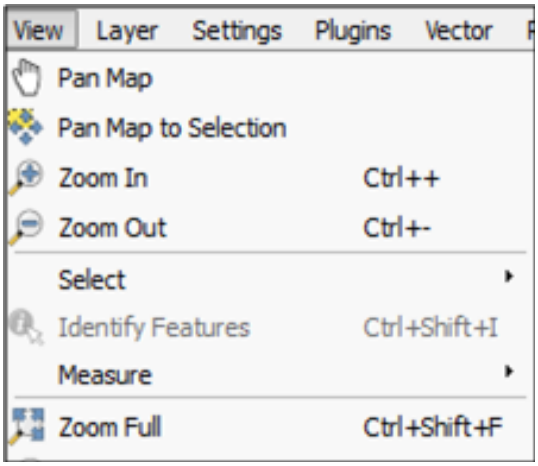
- This is where you are able to Open a map you had worked on before or Save the map you are working on.

Project *refers to the* ***map project*** *you are working on.*



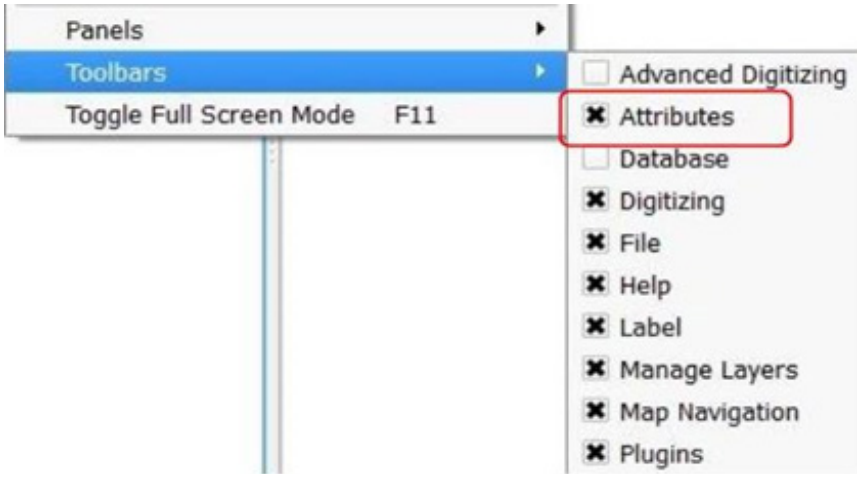
View

The View tab gives you different tools so that you are able to move around your map and have different views. It also provides shortcuts to toolbars and other options. By clicking on Pan Map, you will notice that your pointer will change. This tool allows you to move the features in the map view around. We will explore more of these tools in chapter 9.



The **Zoom In** tool allows you to have a closer view and the **Zoom Out** tool allows you to move your view outwards. The **Zoom Full** tool allows you to view your entire map in full.

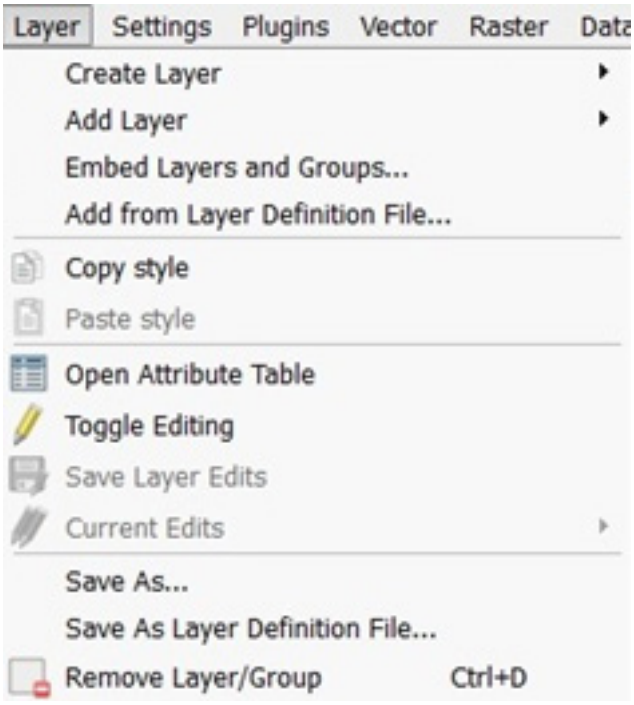
The toolbars tool will give you a list of available tools. The toolbars that are marked with an **x** tells you that the toolbar is already active and that you are able to use it. For instance, Attributes is already selected.



This is what the **Attributes** tool bar looks like when it is selected and active. Since you have not added anything to the map, this toolbar will not be active.

Layer

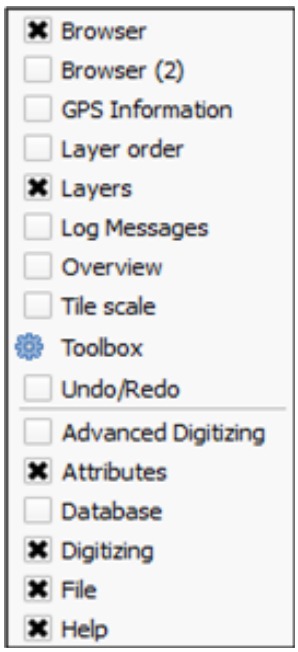
The Layer tab allows you to create a new layer, add layers or remove layers. We will look into this in detail in chapter 10.



Toolbar

The toolbar provides the tools that you will be working with to create and edit your map. Your toolbar may not have the same tools as the image below. Do not panic!

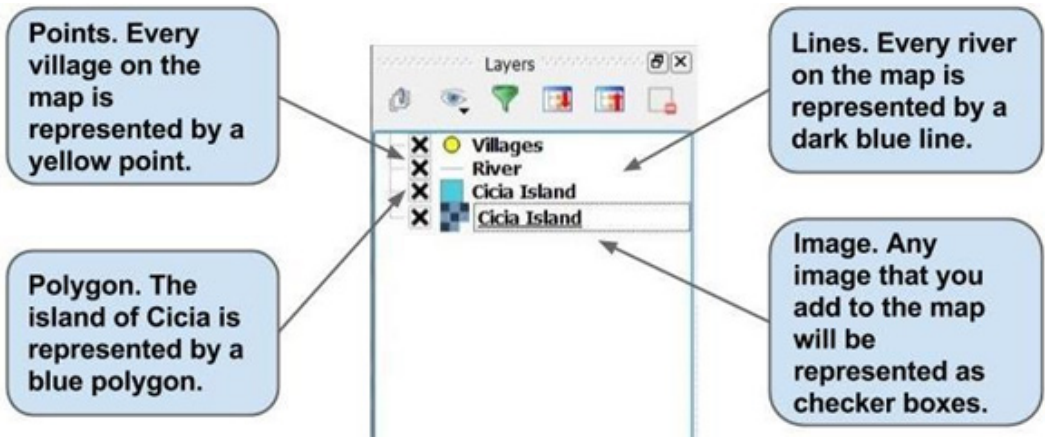
Step 6 – Right click on an empty space on the Toolbar to see the list of available toolbars.



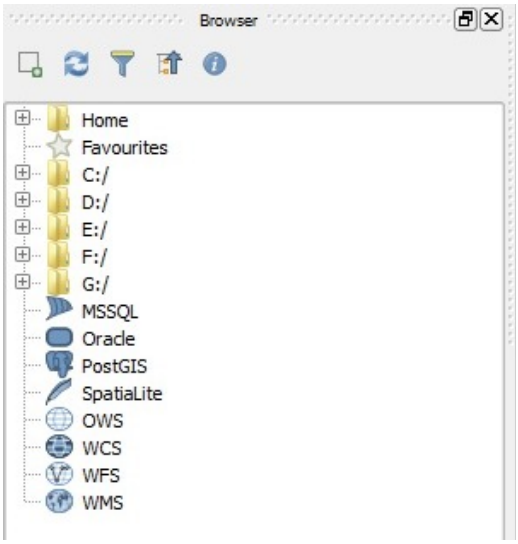
Step 7 – Turn on/off some of the tools to see how they appear by checking and unchecking the boxes beside them. Uncheck and then check the **Attributes** tool from the list and notice it disappear from the toolbar.

i.Layers and Browser

Data (meaning information) can be organized into different layers. For example, if you were to map your community, you will have one layer for houses, another layer for roads and maybe a different layer for vegetation. So, the Layers window is where all the layers you create and add onto the map will appear in a point, line, polygon or an image. The image below shows four different layers: villages, river, Cicia island and an image of Cicia Island.

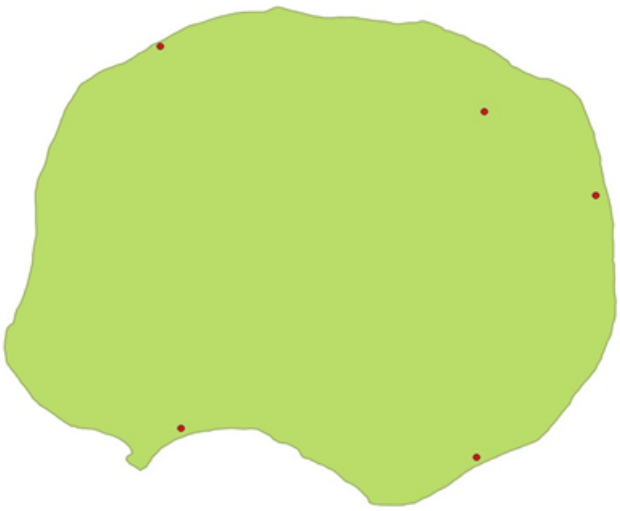


Step 8 – The Browser window gives you a link to all the folders and drives in your computer. So you can drag data from these locations and drop it onto your map view.



ii.Map View

This is where you view your map and all the data that you have added.



iii. Status Bar

When you move the mouse across the map, the **status bar** will show you your current position/location in **map coordinates**. Coordinates is a simple way of finding a location of a place on a map.
**To learn more about map coordinates go to Chapter 8.*

Once you are familiar with the QGIS interface you are now ready to get started with spatial data.
**Spatial data is data that has information about something's location.*

Congratulations

You are now familiar with how QGIS works and ready to learn more. Chapter 8 will introduce you to geospatial data.

Chapter 8 – Introduction to spatial data

Objectives:

By the end of this Chapter, you should be able to:

- Differentiate between vector and raster data.
- Explain how information is stored in vector and raster data files.
- Give examples of geospatial technologies.
- Explain and give examples of the different types of coordinate systems and location.

This chapter provides definitions of important terms in mapping. It also gives an explanation of the different types of data that you will be working with. You will not be tested but you will at least need to understand these words.

Useful terms

• Geospatial Science
The study of location and mapping our community using geospatial technologies. Some examples of geospatial technologies include; ArcGIS, QGIS, Google Earth and satellite images. The QGIS software that you have is an example of a geospatial technology.

• Geographic Information Systems
A computer based system that allows you to collect, store, edit, analyse and create useful maps. It is made up of computers, GIS software, satellite data and human resources.

• Geospatial data
Data that has information on a feature's (e.g. building, rivers, trees) location.

• Location
Location simply is where a person, place or thing is.

• Absolute location
Location of a place, area, building or thing that is known. For example, an address, 54 Rewa Street, Suva Fiji. Using latitude and longitude is also an example of absolute location e.g. Cook Islands is located on 21.200O S, 159.7667O W. These two examples show exact and fixed location.

• Relative location
Using distance and direction to tell the location of a person, place or thing. For example, Village A is 10 miles East of Village B.

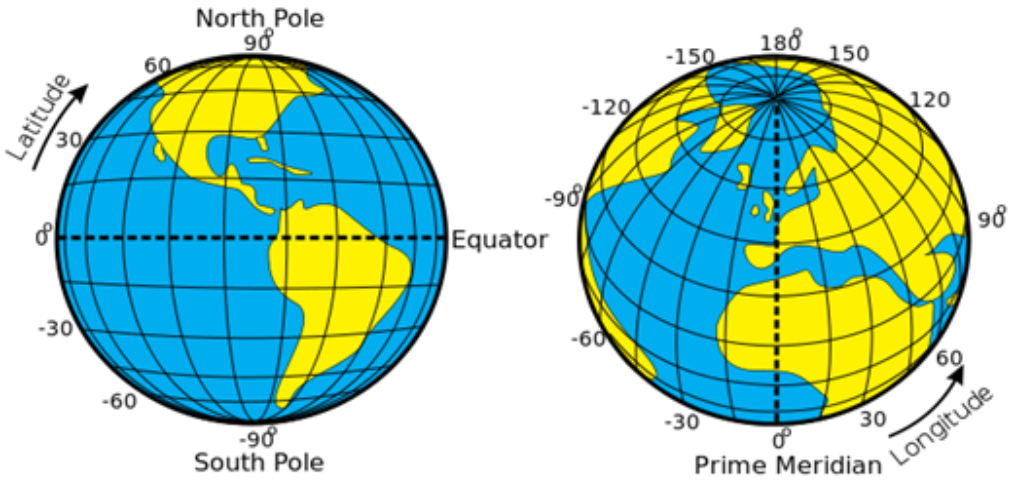
• Coordinate System
It is a numerical system used to describe a location. The Earth is split into grids with numbers on an **x** and **y** axis and you can find a place using numbers. There are three common coordinate systems: the Geographic coordinate systems, the Projected coordinate system and the State Plane coordinate system.

The example below shows the image of Suva, Fiji. If we place a grid over the image we can give the location of **A** as 1.5 and 0.5. The location is calculated as the distance from 0 (the point of origin) as shown by the red dotted lines. Where 1.5 is the **x value** and 0.5 is the **y value**.

B is -0.5, 0.5 and **C** is -2.5, -1.5. You will notice that if a location falls left or below 0 the numbers are negative whereas a location on the right or above the numbers positive. This is just a simple way of defining location.

• Geographic Coordinate System

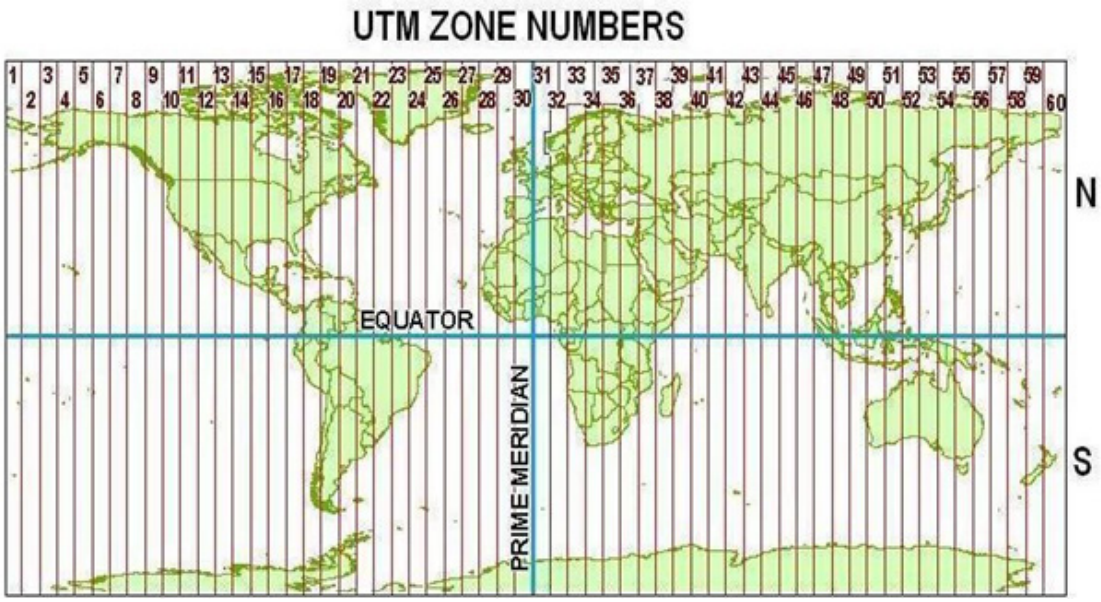
Uses latitude and longitude to show location on the Earth and units are in degrees. For example Suva city is located at 18° 10'S, 178° 27'E. Lines of latitude run north and south parallel to the equator. Positive numbers represent a location north of the Equator; negative numbers represent a location south of the Equator. So, 18° 10'S, 178° 27'E means that Suva is located South of the Equator and East of the International Dateline.



Source: http://www.geographyalltheway.com/ks3_geography/maps_atlases/longitude_latitude.htm

• **Projected coordinate system**

Locates position on the Earth relative to the point of origin (0,0) or x and y values. The Earth is divided into 60 zones and the location of a place is calculated by its distance from the point of origin (0,0). In creating flat maps we use the most common Projected coordinate system known as the Universal Transverse Mercator (UTM). The UTM uses linear units such as meters, kilometres or miles. This is useful as it can measure distance between places. **In your mapping exercise you will be using the Projected coordinate system (UTM) as it measures distance in linear units.*



Source: http://earth-info.nga.mil/GandG/coordsys/grids/universal_grid_system.html

• **Features**

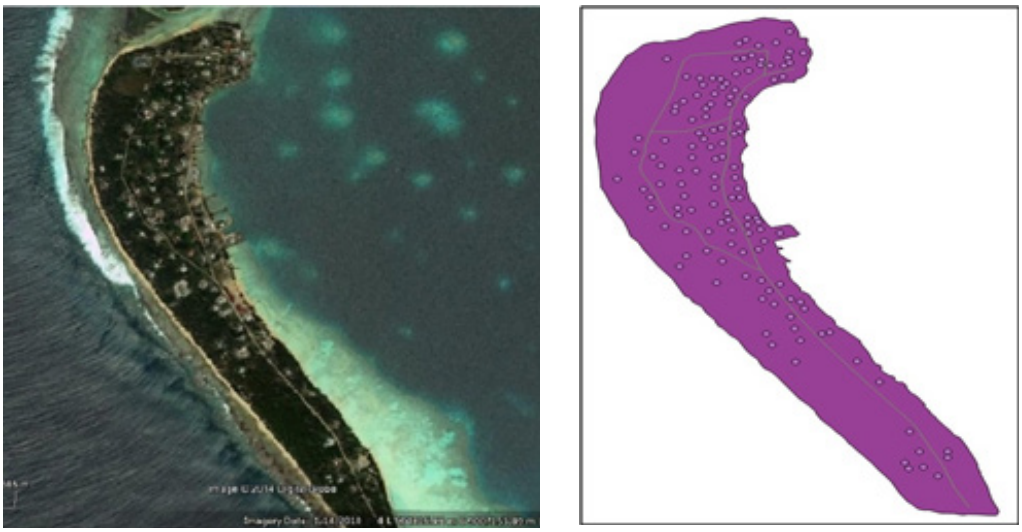
Anything that are in our environment e.g. buildings, trees, rivers, coastlines, crops. On maps, they appear as points, lines and polygons.

TWO types of spatial data in GIS

Vector Data Model	**Raster Data Model**
The real world is represented as points, lines and polygons. Buildings and villages are usually represented as point features. Rivers and roads are represented as lines and large areas such as; mangroves, plantations and rugby fields are usually represented as a polygon. Points, lines and polygons are an example of vector data.	The real world is represented in an image. The image is made up of small cells. For example, an image such as a Google Earth image, LandSAT image, JPEG or a TIFF file to name a few.
Information about each point, line or polygon is stored in a table called the attribute table.	The cells are organized into columns and rows. Each cell has a value which represents information. For example, a value could be 3. All cells with a value of 3 will appear green. The green means vegetation.

Reality modelled as a raster and vector model.

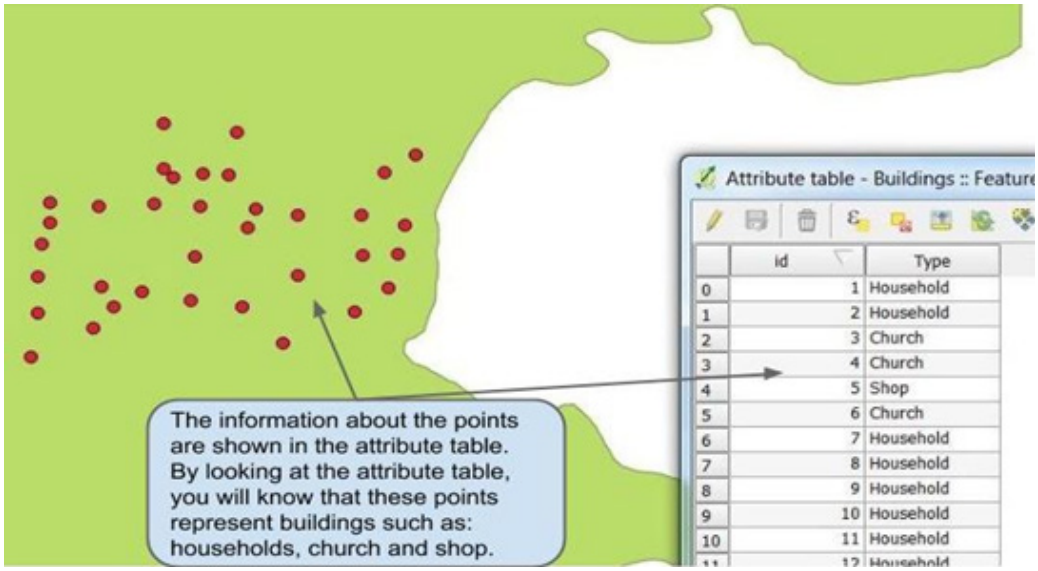
The reality model below shows the island of Omoka, Cook Islands. On the left is the raster model and on the right is the vector model. Notice how the buildings, roads and the island is represented as points, lines and polygon on the vector model on the right?



When you zoom in closer on a raster image like the image of Omoka above, you will see the square cells (a **matrix of cells**). See image below.

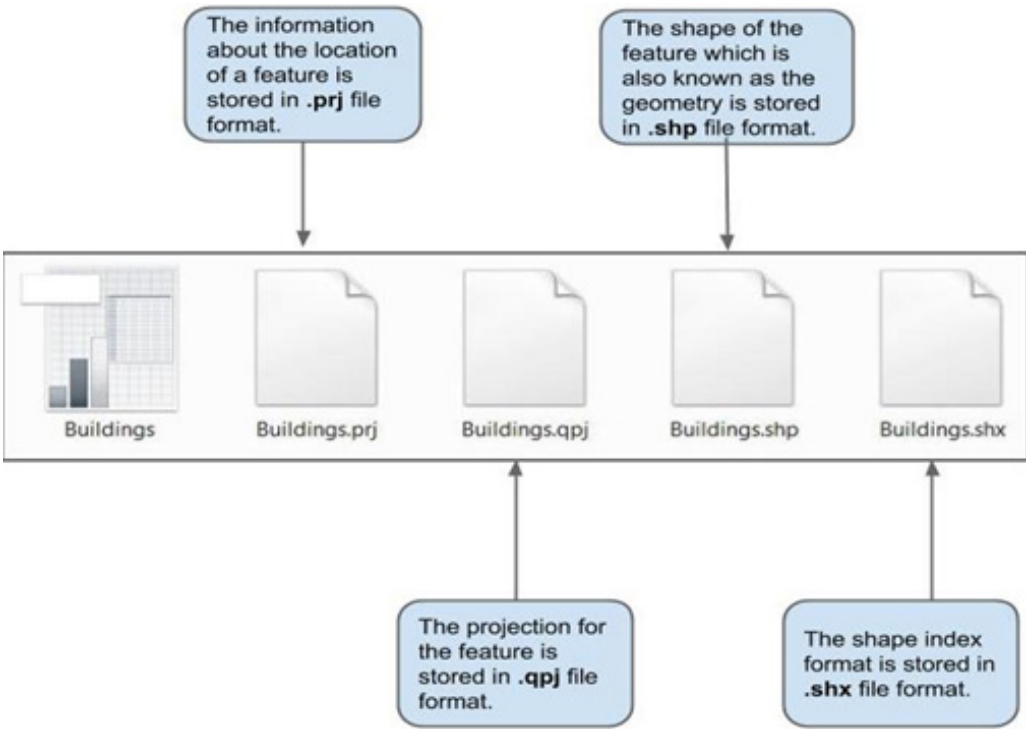
• **Attribute table**

A table that shows the information about the points, lines or polygons. Although attribute tables are not shown on the map, they provide the information that you can create your maps from. This is where the skills you learned using the OpenOffice and Microsoft Excel Spreadsheet will come in handy. You will understand how this works in the next chapter.



Vector file structure

Each feature (point, line or polygon) has different data stored in the following file format.



The most important thing to understand here is the **shapefile or **.shp** which is the shape of the feature. In QGIS this is what you will be seeing in your map, **the shape**.*

However, all of the file formats are important. If you decide to copy the shapefile into another USB, you need to copy all of the files. So for this example, you will need to copy **Buildings.prj, Buildings.qpj, Buildings. shp and Buildings.shx**.

Step 1 – Go to your Documents folder and open the Tutorial data folder. Click on the Cicia Island folder to open it. Can you see the different file formats?

Step 2 – Close the folder.

Take time to understand the important terms in this chapter, once you are done continue to chapter 9! Chapter 9 will guide you on how to read a map.

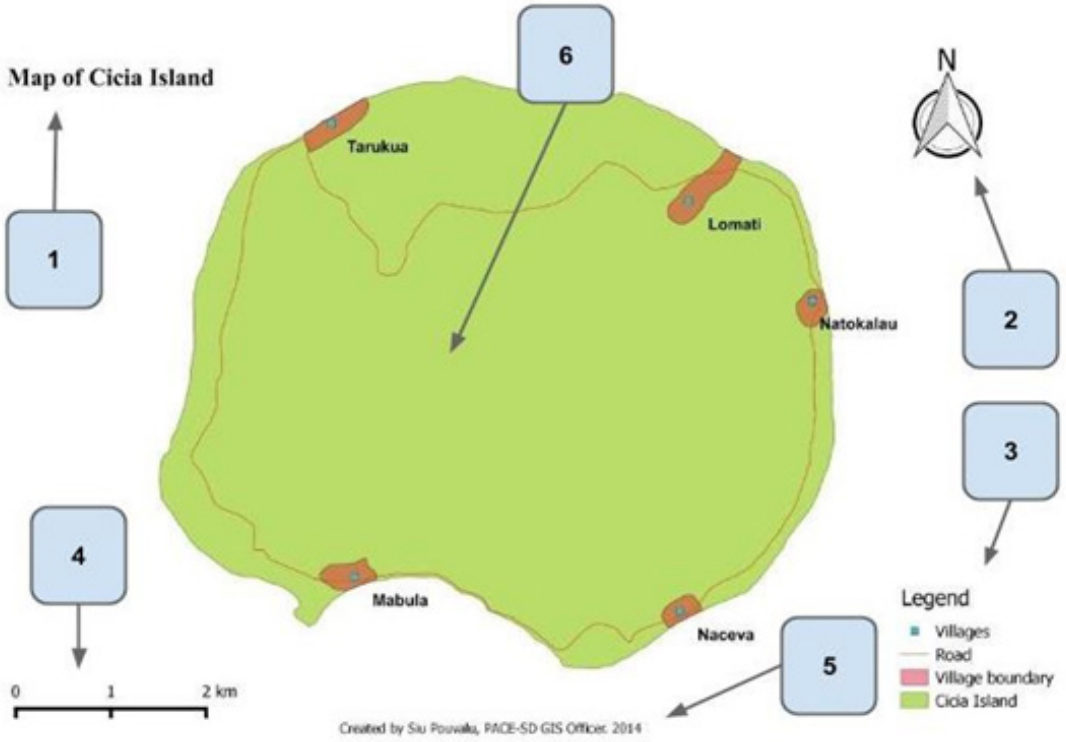
Chapter 9 – How to read a map

Objectives:

By the end of this Chapter, you should be able to:

- Identify the main parts of a map.
- Read a map.

This chapter will guide you on how to read a map. So before you actually create a map, you will need to know how to read a map first. Study the map or the image below and the descriptions that follow.



1. Title

• The first thing you need to look at is the Title. The title will tell you what this map is showing, right now you know it is a map of an island called Cicia.

2. North Arrow

• In the top right hand corner is the **north arrow** (it can be placed anywhere on the map). The north arrow tells you which way is North on the map. The North Arrow gives you direction such as; Lomati village is North of Naceva village or that Mabula is in the South Western side of the island.

3. Legend

• The Legend explains what the points, lines, polygons and different colours on the map mean. Inside the map, you see names, blue dots, red polygons and orange lines. What do they all mean??

• The **Legend** tells you that the blue dots are villages and are labelled with their names, orange lines are roads and the red polygons are village boundaries and the green larger polygon is Cicia Island.

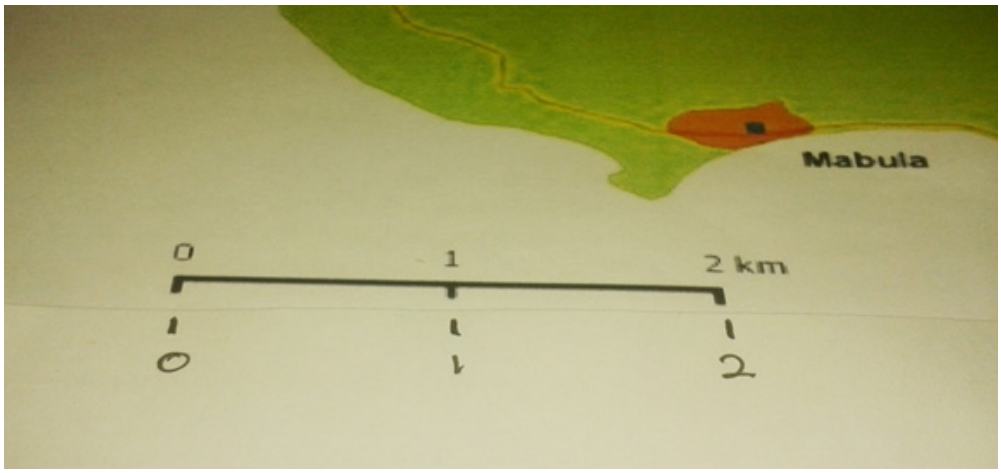
• So in this map, it gives you information on how many villages are on Cicia Island (5 in total), the names of the 5 villages, how big each village is, how far apart the villages are from each other and how many roads are on the island.

• Maps can give you a whole lot of information and it is very important that you know how to read one.

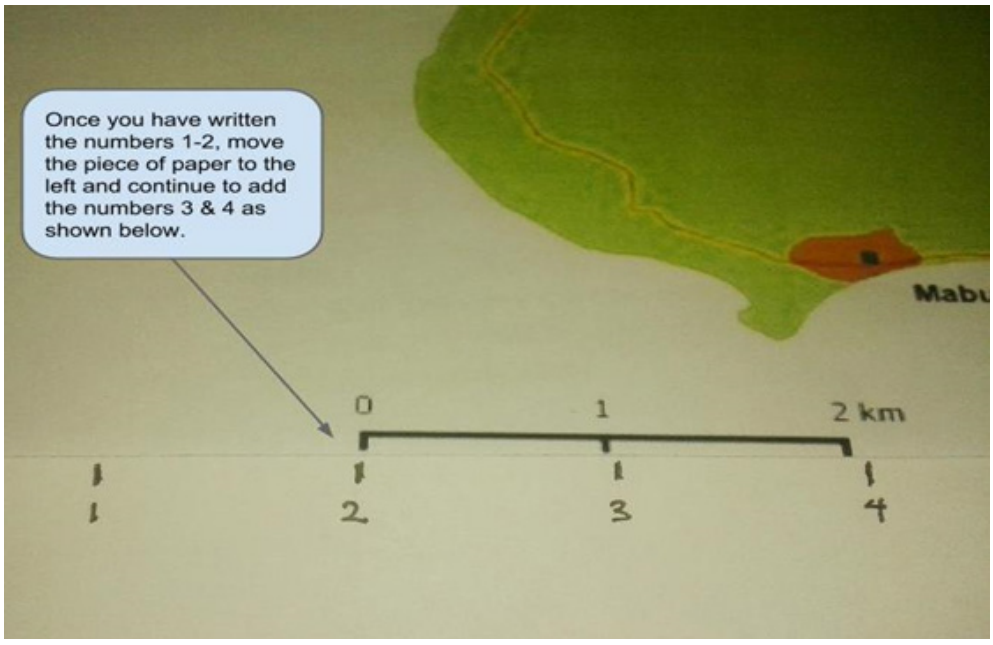
4. Scale

• The **scale** gives you the distance on the map in relation to the distance in real life. For example, you can use your map scale to approximate the distance between places on your map. From Mabula to Naceva is approximately 4km.

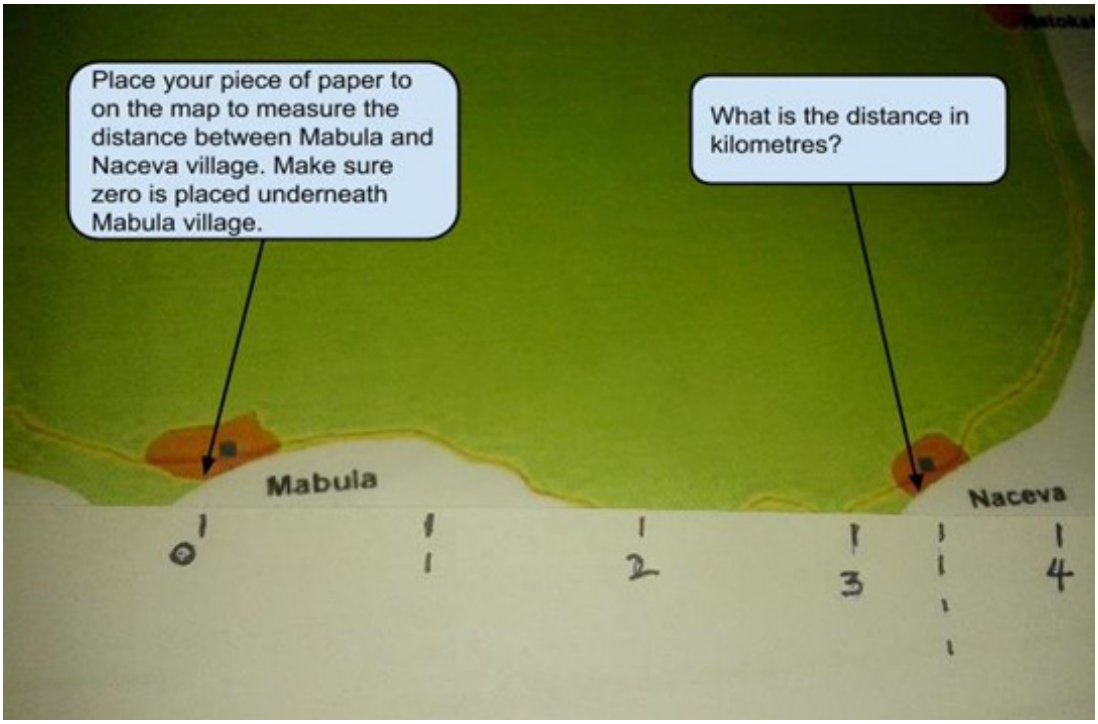
• To see how the scale measures distance, place a piece of paper beneath the scale of the map. Trace the scale onto one edge of your piece of paper and make sure to mark 0, 1 and 2.



• Then move your piece of paper to the left , add 3 and 4 to your scale to make it 4 km.



• Place your piece of paper on the map, so that the 0 is directly on top of Mabula and the rest of the piece of paper towards Naceva.



What is the distance between Mabula and Naceva?

5. Creator

• The person or organization that created the map. It is always good to make sure that whoever receives this map knows who created it. Usually the name of the person and organization that created the map is found in smaller letters at the bottom of the map.

6. Map Content

• The map content shows details of your data in points, lines or polygons. The legend should help you read and make meaning. What does the map tell you?

**Every map should have all 6 parts named above. They do not have to be in the same position shown in the picture. You are free to place the Title or legend anywhere on your map, you will learn more in Chapter 10.*

Congratulations

You have learned how to read a map. Chapter 10 will teach you the basic skills on how to create your own map!

Chapter 10 – Creating a map

Objectives:

By the end of this Chapter, you should be able to:

- Use the tools on QGIS to add and edit vector data.
- Know the difference between point, line and polygon features.
- Change the colours and symbols of features on a map.
- Perform a query.
- Label features on a map.
- Create a simple map using vector data and save it as a .jpeg image.

**The next couple of chapters will teach you various skills that you will use to collect data of our community. These data will be used to create maps to show the problems and issues that your community is facing. So as you work your way through to the end, keep in mind what type of data are you going to need to collect to create your map. Also remember that these data and maps will be something that you can present to your local authorities, donors or regional organizations to assist your community.*

This chapter is divided into 6 sections.

10.1 – Symbols
10.2 – Performing a query
10.3 – Labelling
10.4 – New Print Composer
10.5 – Saving a map
10.6 – Open and save project

**To watch a video tutorial for 10.1 & 10.2, open the video file named Chapter 10 part 1.*

10. 1 Symbols

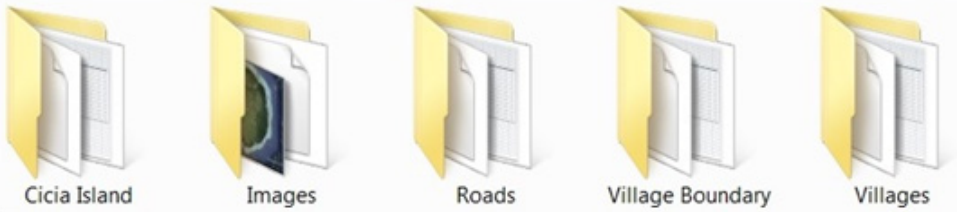
In Chapter 9, you learned how to read a map and the important things that a map should have. When you want to create a map, it is always important to know the purpose of your map. This means, you should know what you want people to know or learn from your map. It is also important to make simple maps so that other people are able to understand what your map is trying to show.

For this exercise, we want to show:

- How many villages are on Cicia Island.
- The location of each village.
- The names of each village.
- The distances between the villages.

Step 1 – Go to the **Community Mapping Tool-kit** folder.

Step 2 – Open the Tutorial data folder. You will see the folders as shown below. There are shapefiles in each folder that you are going to be working with. So everytime, the instructions tell you to add a certain feature, you will find it in the Tutorial data folder.



Step 3 – Close this window.

Step 4 – To watch the video tutorial for this session, go to your **Community Mapping Toolkit** folder and open the **Video tutorials** folder. There are two videos in this folder labelled, **Chapter 10 Part 1** and **Chapter 10 Part 2.**

Step 5 – Right click on the video **Chapter 10 Part 1**, click Open with and select **VLC media player** to play the video. Once you have finished watching Part 1, continue on to step 6.

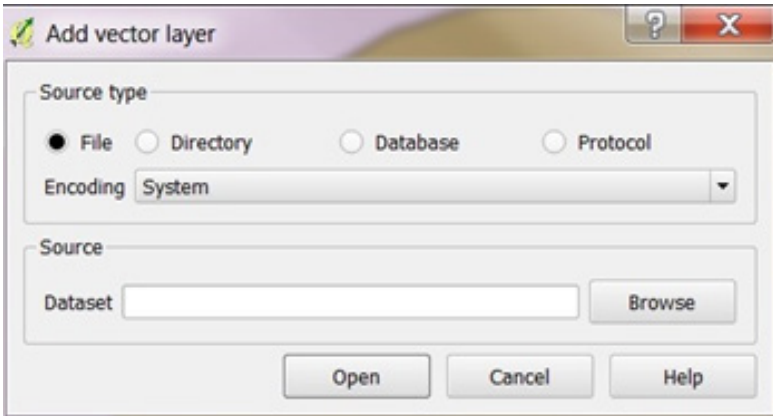
Step 6 – Start QGIS.

Step 7 – Check whether the **Manage Layers** tool is active and that you can see it (see image below).

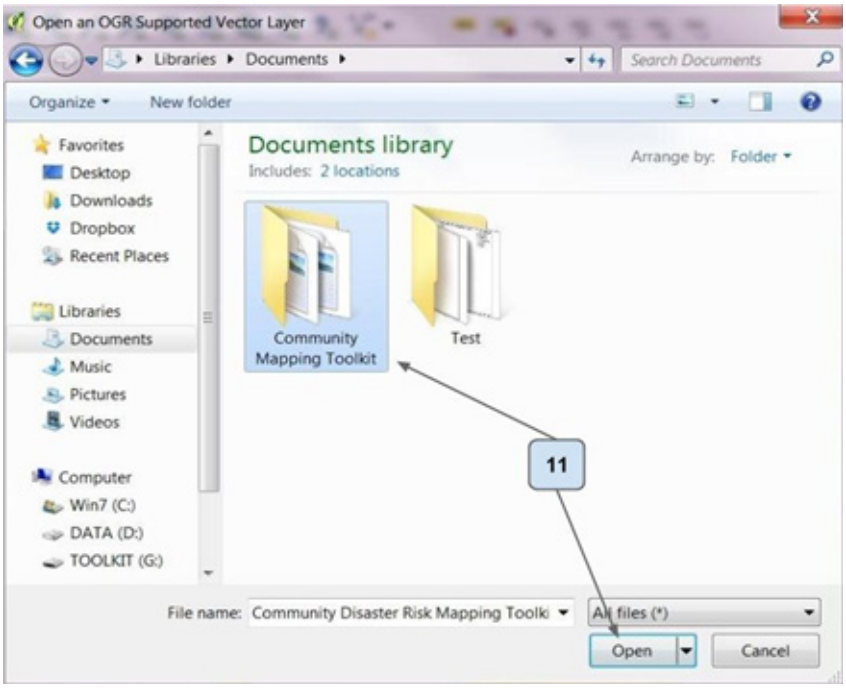
Step 8 – If you do not see the **Manage Layers** tool above, right click on any empty space in the Tool bar and check the **Manage Layers** toolbar. You will be using this tool a lot, so you will need to be familiar with it. **See image below*.

Step 9 – Click on the **Add Vector Layer** tool.

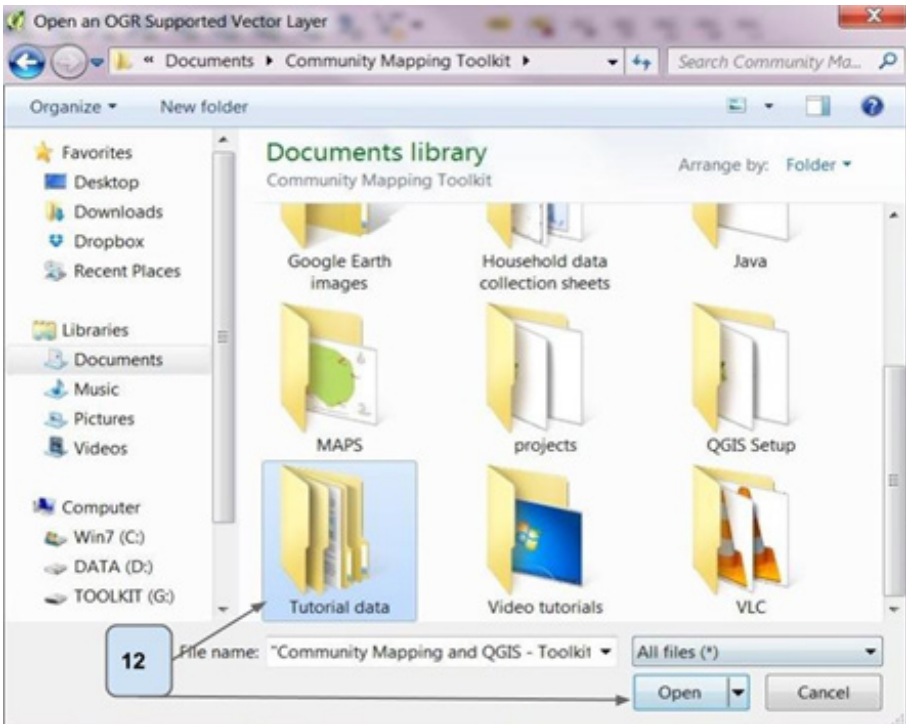
Step 10 – For the Source type, select **File** and then click on **Browse**.



Step 11 – Once you click on **Browse**, go to your **Documents** folder and click on the **Community Mapping Tool-kit** folder and then click **Open**.



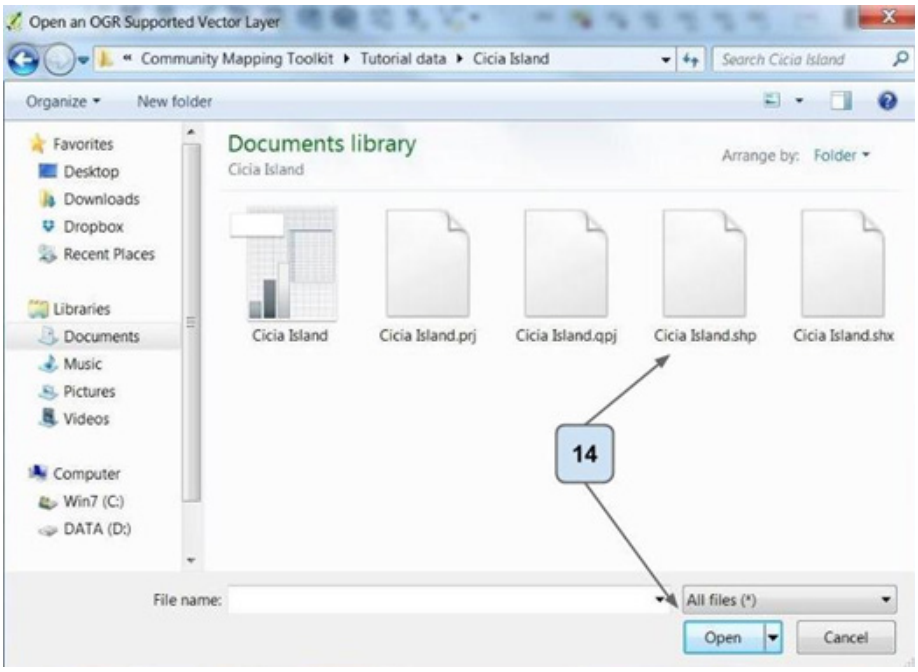
Step 12 – Click on the **Tutorial data** folder and then click **Open**.



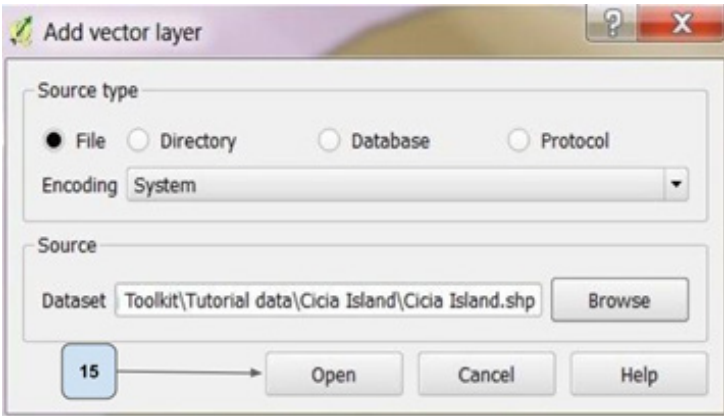
Step 13 – Double click on the **Cicia Island** folder to open it. You will see some of the file formats that you learned earlier on (.prj, .shp, .shx, .qpj)

Now because we want to see the shape of the feature in order to create a map, we are going to add the **shapefile** only or the .**shp**.

Step 14 – Click on the **Cicia Island.shp** and then click **Open**.



Step 15 – The **Add vector** layer window will appear again. Click **Open**.



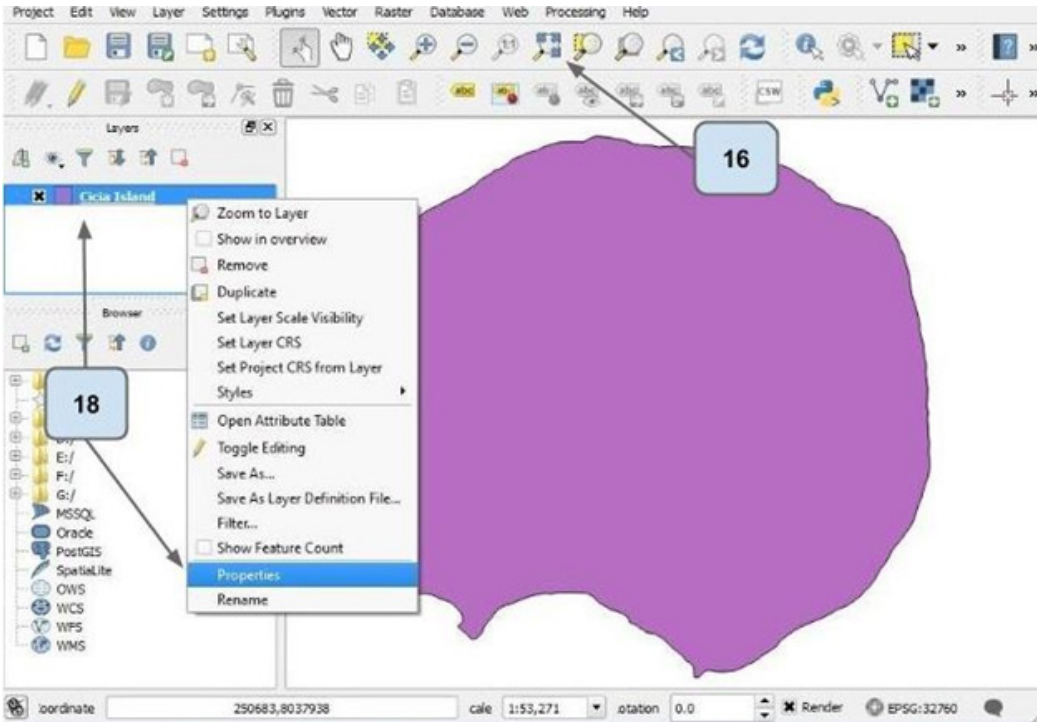
Your map should look something like the image below but may have a different colour.

- Is the Cicia Island layer a point, line, polygon or an image?

Now we are going to change the colour of the layer you have just added.

Step 16 – If your map has moved around and out of your screen you can bring it back by clicking on the **Zoom Full** tool.

Step 17 – If you do not see the **Zoom Full** tool then right click on any empty space and check **Map Navigation**.



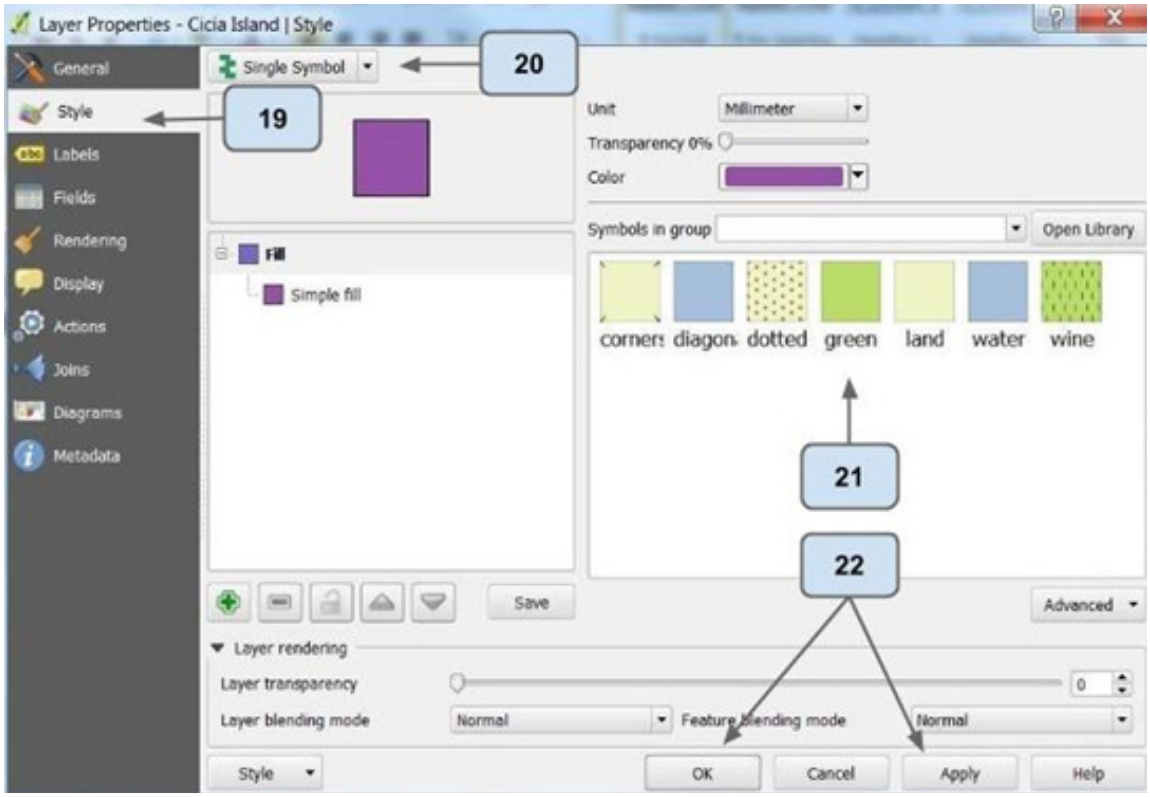
Step 18 – In the Layers window, right click on the layer **Cicia Island** and click on **Properties** to open the Properties window. The Properties window is where you can make changes to the colour and symbols of the layers.

Step 19 – Once the **Layer Properties** window appears click on **Style** on the top left hand corner. This is the Style tab where you can choose and change the symbols and colours for the layers.

Step 20 – Notice the symbol for this layer is a **single symbol**. This means there is only one colour for this layer. **You will learn about using multiple colours and symbols in Chapter 11*. If you click on the small arrow you will see other ways that you can symbolize your data.

Step 21 – Click on the green tab.

Step 22 – Click **Apply** and then **OK**.

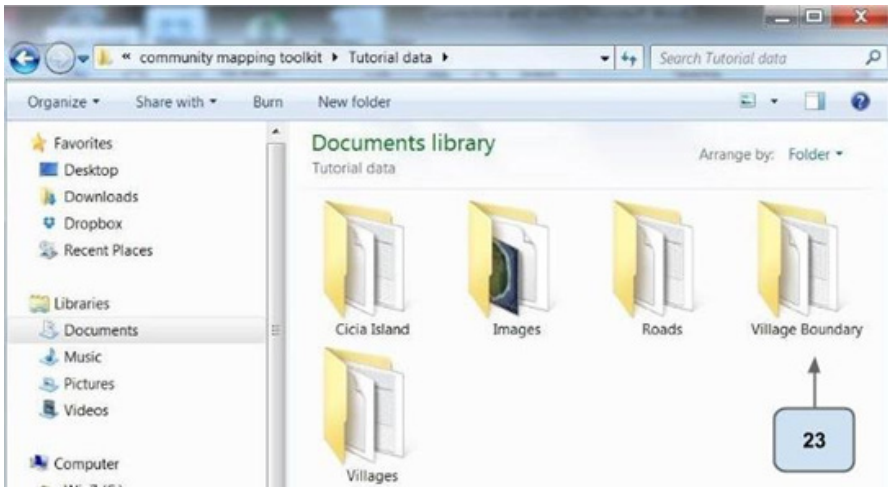


You will see that the colour for Cicia Island has now changed to green.

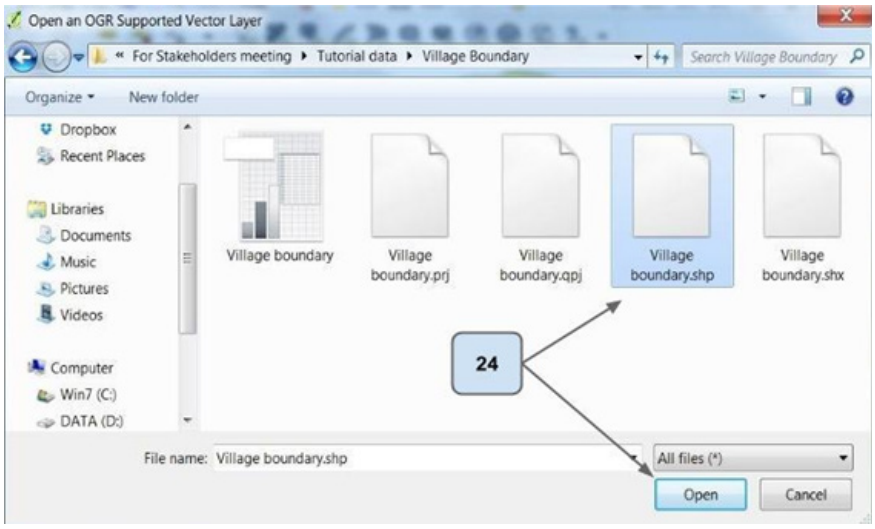
Congratulations

You have successfully changed the colour for the Cicia Island (polygon) layer.

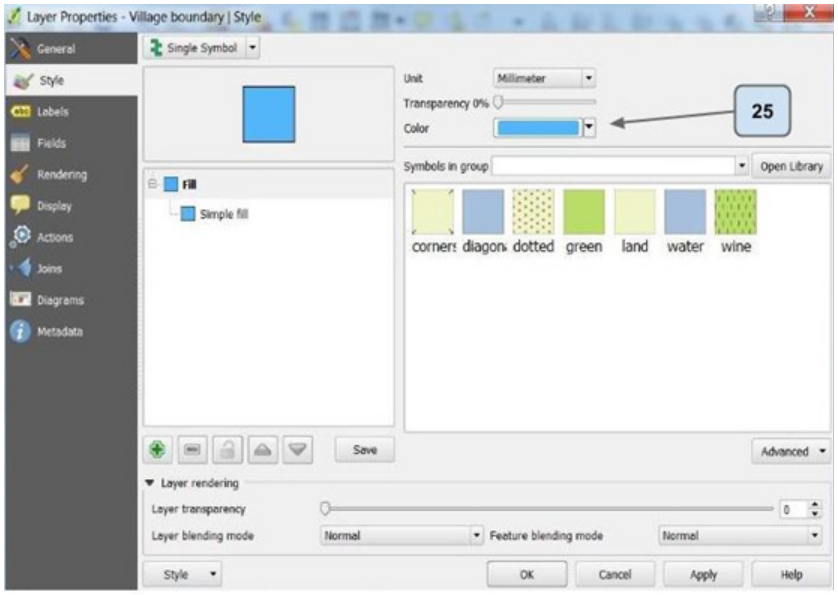
Step 23 – Now we are going to add some other data onto the map. Click on the **Add vector** layer and open the **Village boundary** folder.



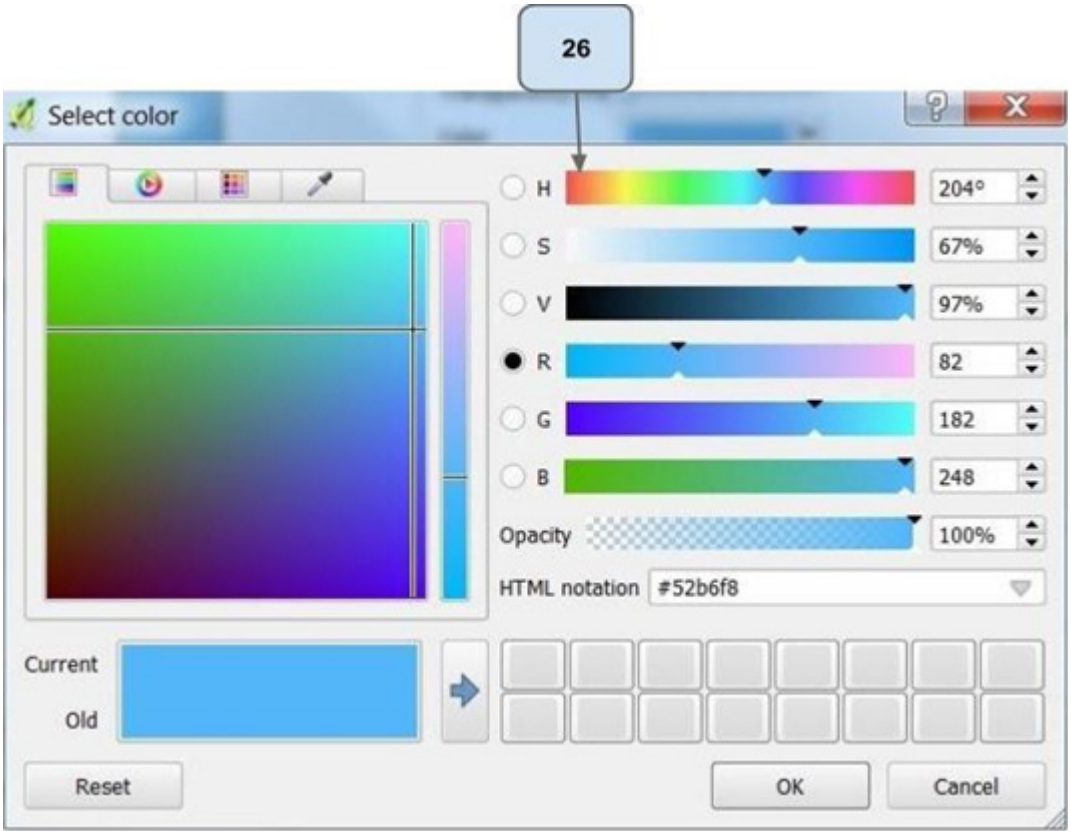
Step 24 – Click on the **Village boundary.shp** and then click **Open**.



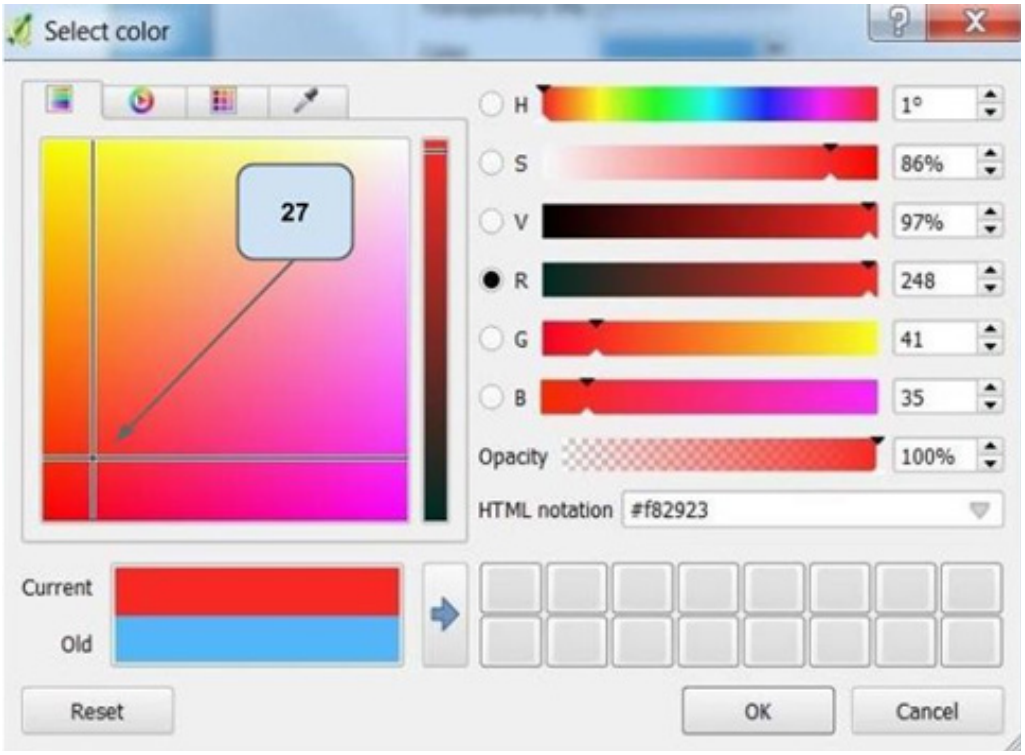
Step 25 – Double click on the **village boundary** layer to open the properties window. Change the colour of the village boundary to red by clicking on the colour pane.



Step 26 – The Select colour window will appear (see image below). Click on the colour red.

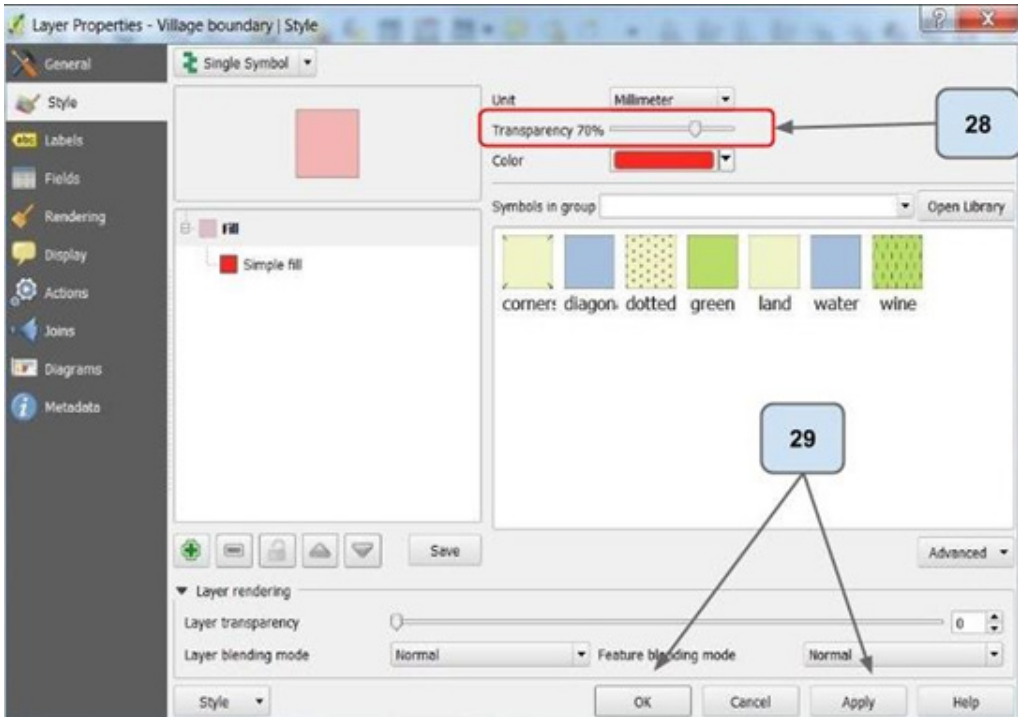


Step 27 – Move the cursor to the area with the bright shade of red and then click **OK**.



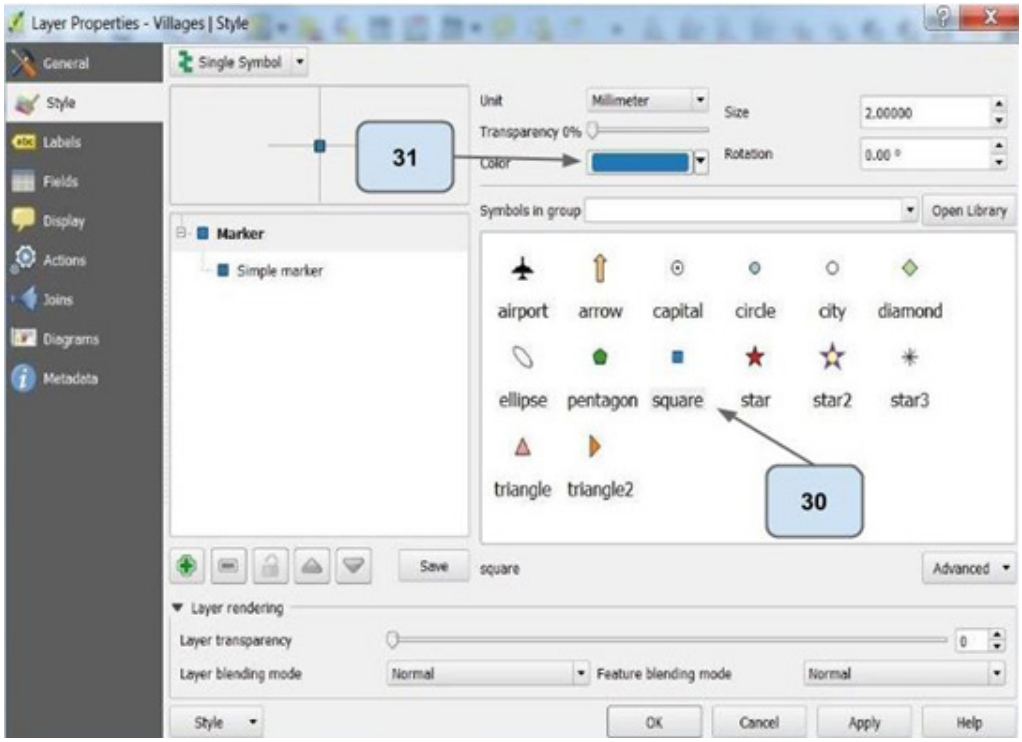
Step 28 – Now change the **Transparency** to 70%.
**Changing the transparency will allow you to see through this layer to another layer beneath it*.

Step 29 – Click **Apply** and **OK**.

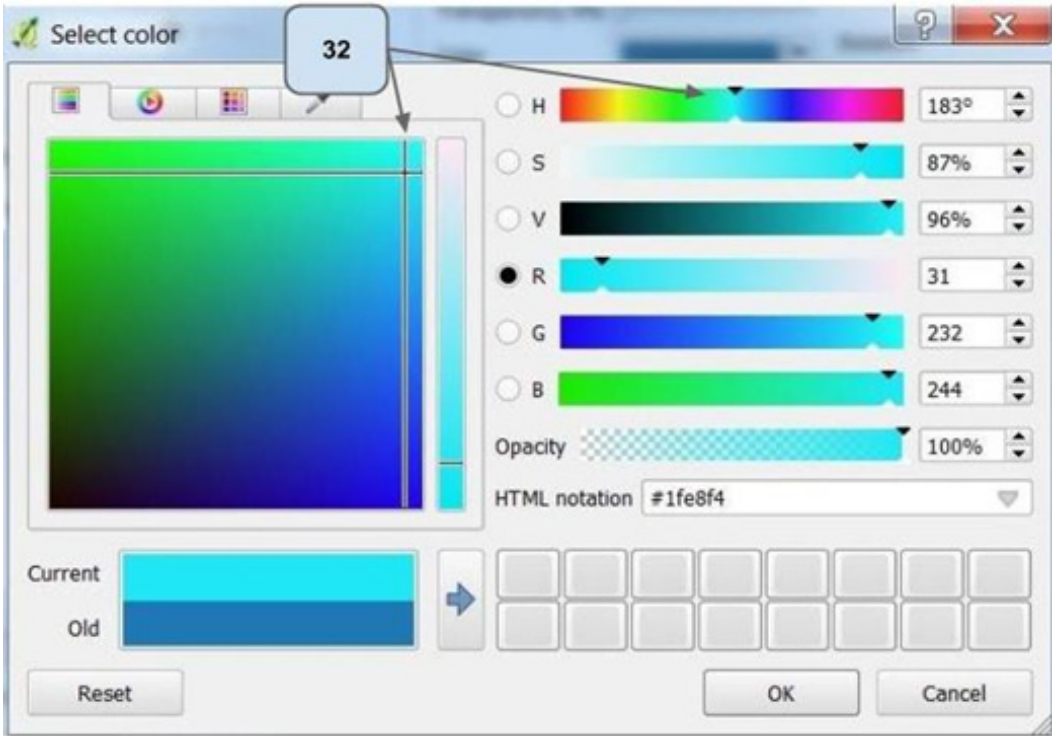


Step 30 – Now add the **villages.shp** and change the symbol by selecting the blue square.

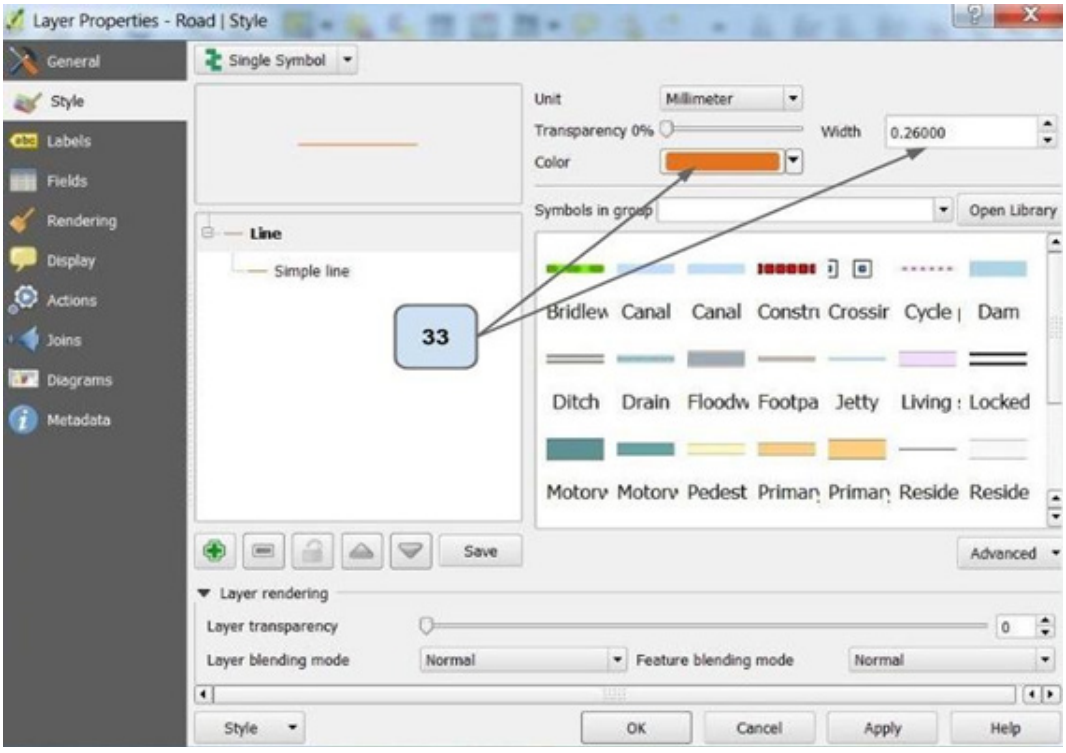
Step 31 – Change the colour to a light blue by clicking on the colour pane.



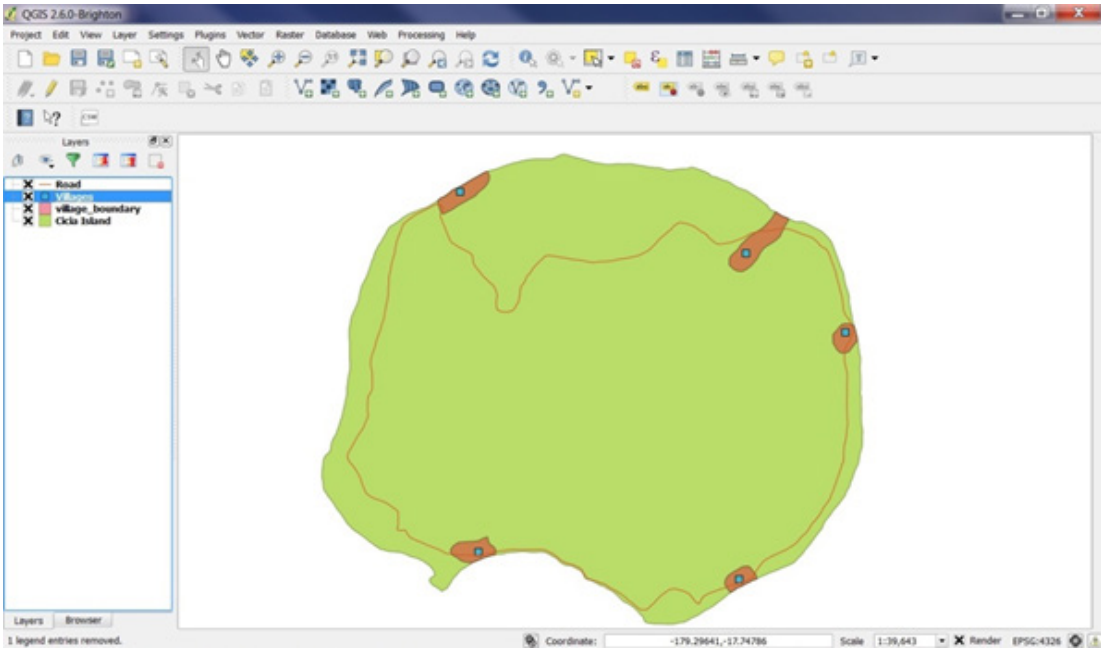
Step 32 – On the Select colour window, select a light blue colour and then click **OK**.



Step 33 – Add the **road.shp**, open the properties window and change the colour for the road layer to orange. Notice there are different symbols that you can use for roads but for now we will keep it as a simple line. Make sure that the **Width is 0.26000**. You can experiment with the size and choose the size you see fit, however, it is best to have thin lines so they do not seem too large but big enough to be seen.



Step 34 – Click on **Apply** and then **OK**. Your map should now look like the image below.



Step 30 a. – Now notice in the Layers window how the layers are ordered with the roads (line) layer right at the top, buildings (points) and then the polygons at the bottom? **When creating maps, you must always organize your layers with the points and lines above the polygon, otherwise you will not see them in your map. That is why we change the transparency of polygons to be able to see other layers beneath it*.

Do you think the light green is suitable for Cicia Island? When choosing colours to represent features on Earth choose a colour that best represents them. E.g. green for vegetation or land. Blue is used to represent rivers, creeks and the ocean. Sometimes we use red or orange to highlight something very important!

Step 30 b. – Now, before we continue to the next section you need to save your map project so that you don't lose it. Go to **Project** in the top left hand corner and click **Save As**.

Step 30 c. – Go to the Community Mapping tool-kit folder and save your project in the **Projects** folder. If you close the QGIS now, you can always work on your map later as you have saved it in the Projects folder.

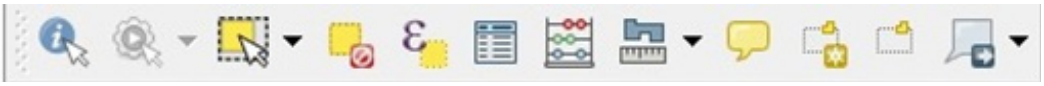
Congratulations

You have now successfully changed the symbols, colours and sizes of the features!

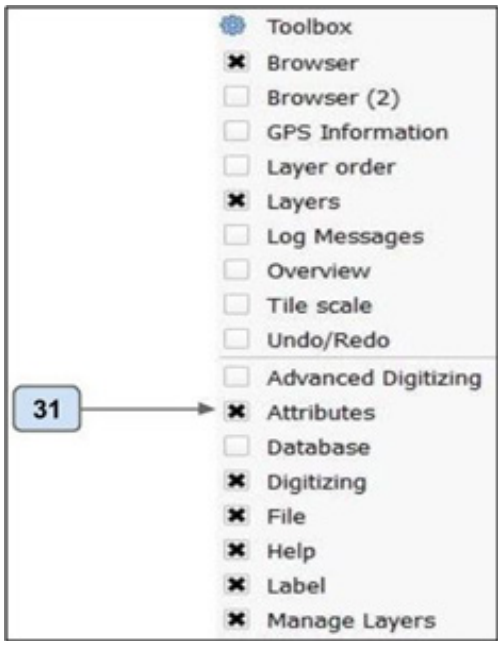
10. 2 Performing a Query

Now we are going to see one of the things that you can do to make your maps look interesting in QGIS. You can do this by performing a **query**. A query allows you to ask QGIS to only show some parts of the features that you want to see. Let's do a query!

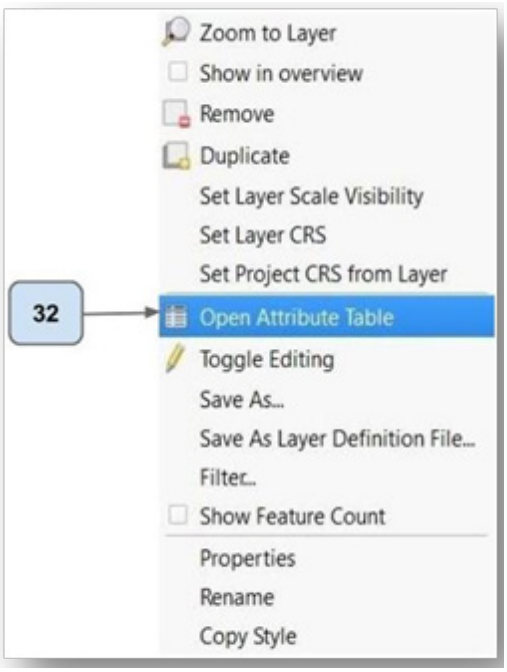
Make sure that the Attributes tool is visible on your toolbar.



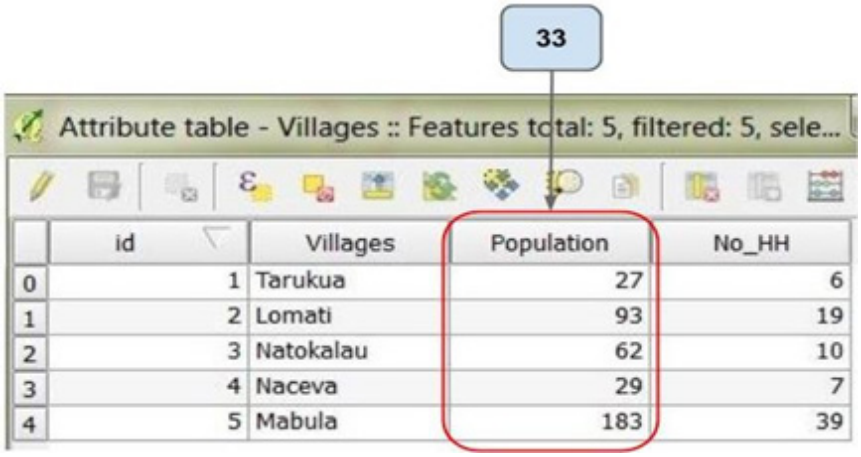
Step 31 – If you do not see it, right click on an empty space in the toolbar and check the box next to **Attributes**.



Step 32 – On the **Layers** window, click on **Villages** to highlight it. Right click on the **Villages** layer and open the attribute table.



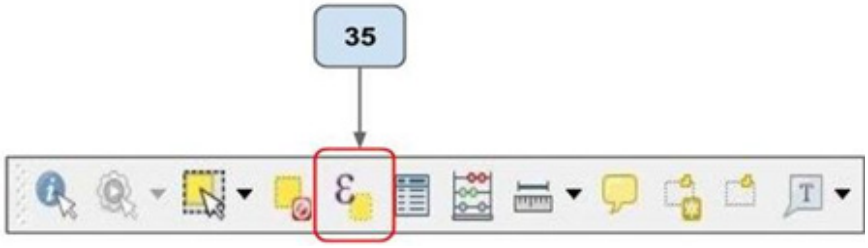
Step 33 – Look at the column with the field name **Population**, this is the field we are going to **query**.



	id	Villages	Population	No_HH
0	1	Tarukua	27	6
1	2	Lomati	93	19
2	3	Natokalau	62	10
3	4	Naceva	29	7
4	5	Mabula	183	39

Step 34 – Close the Attribute table.

Step 35 – On the attribute toolbar, click on the **Select features using an expression tool**.



The **Select by expression** window will appear and this is where you will ask QGIS to only show what you want (query).

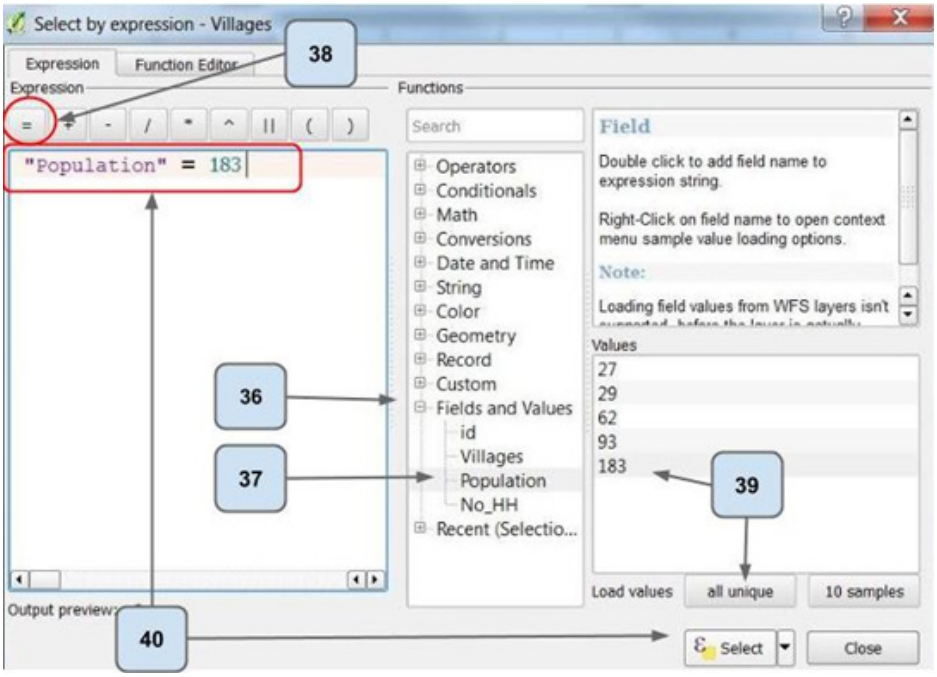
Step 36 – Double click on **Fields and Values** to expand it. Now you can see the headings that were on the attribute table under ***Fields and Values***. (See image on the next page)

Step 37 – Now we want to show the field **Population**. So go ahead and double click on **Population**. You will see that the 'Population' will appear in the expression window where your query is built as shown on the image on the next page.

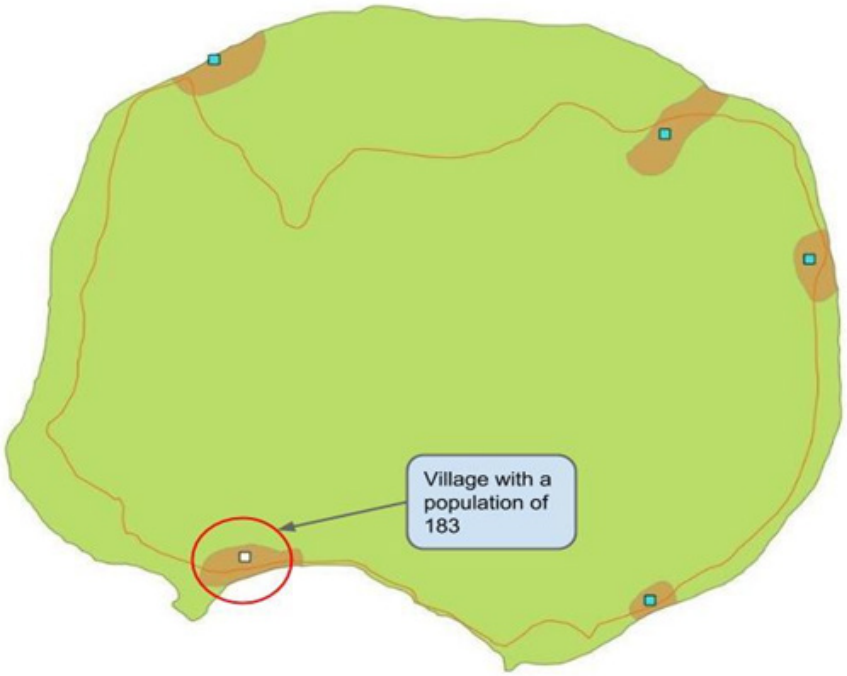
Step 38 – Click on the = sign in the **Operators** tab.

Step 39 – Click on **all unique** in the **Field values** tab and then double click on 183.

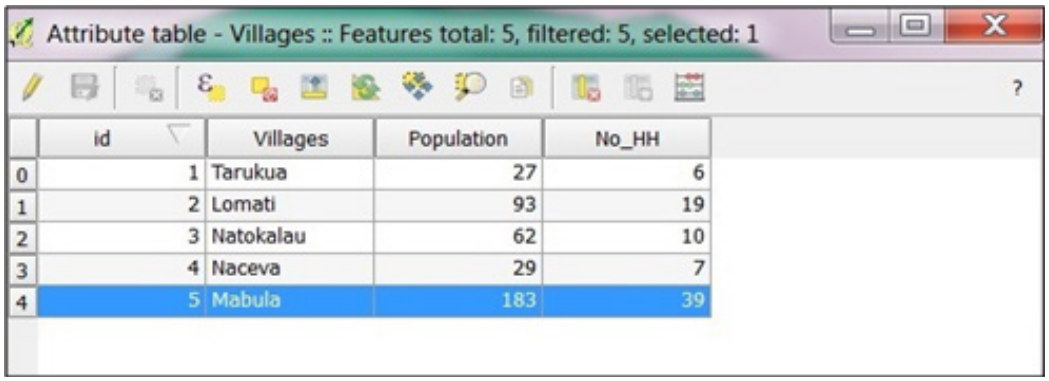
Step 40 – The expression that you created should be **Population = 183**. Click Select and then close the window. **If you make a mistake with your equation you can always press the backspace button on your keyboard*.



- The query that you have just built, will show the villages that have a population of 183.
- On your map, you will notice that one of the villages (points) is highlighted in white. **This is the village that has a population of 183**.



Step 41 – In the layers window, right click on the **villages.shp** and open the attribute table. Notice how one of the rows is highlighted? (See image on next page). What is the name of the village with a population of 183?

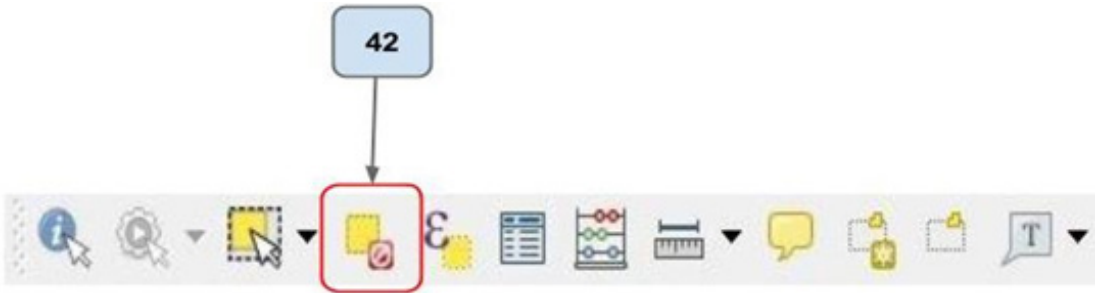


	id	Villages	Population	No_HH
0	1	Tarukua	27	6
1	2	Lomati	93	19
2	3	Natokalau	62	10
3	4	Naceva	29	7
4	5	Mabula	183	39

Can you see how the Attribute table is linked to the map?

**The Attribute table is where the data and information about the points, lines and polygons are stored. This is why it is important for you to store your data in tables as we learned in Chapter 6. Mapping would be easier and fun for you!*

Step 42 – On the Attribute toolbar, click on the 'Deselect Features from All Layers' tool to clear the row from being highlighted. After you perform a query always remember to deselect features.



You will now notice that no features are now highlighted on your map.

Congratulations

You have successfully performed a query and you are becoming an expert!!

10. 3 Labelling

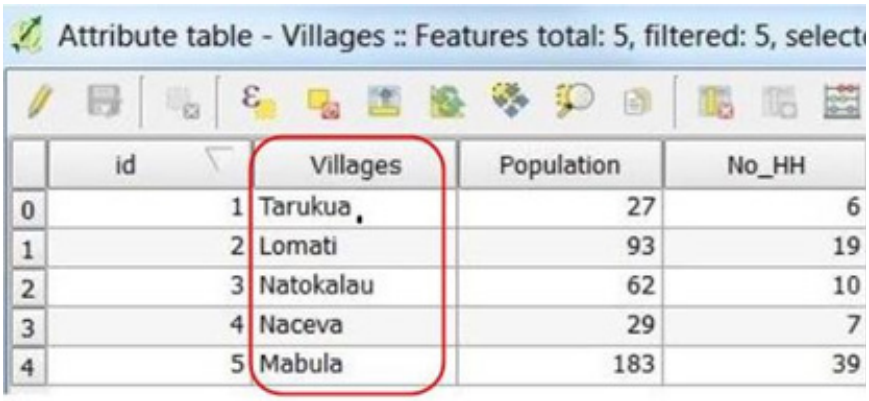
One of the things that will make your map more readable is using **labels**. If someone was to look at your map, they would not know what those points are or what they mean. We are going to label the **Villages** layer.

* *To watch a video tutorial for 10.3 & 10.4 open the video file named Chapter 10 part 2*.

Step 43 – In the Layers window, right click on the **Villages** layer and click on **Open attribute Table**.

The Attribute Table stores all the information about each layer. Since you have opened the attribute table for the Villages layer, you should see information about all the villages, the id number, their names, total population in each village and the number of households. Which of the following columns do you think is the best one to use to label the villages?

Since we want to label the villages, it would be best if we label them using their names. If anyone was to read your map, they would know the name of this village. ***(Note that in order to label a feature, it must have an attribute or some sort of description stored in the attribute table)***.

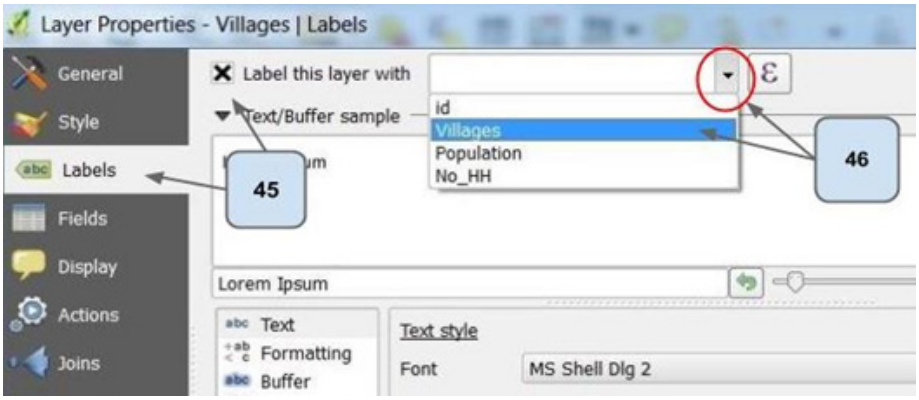


	id	Villages	Population	No_HH
0	1	Tarukua	27	6
1	2	Lomati	93	19
2	3	Natokalau	62	10
3	4	Naceva	29	7
4	5	Mabula	183	39

Step 44 – In the Layers window, double click on **Villages** to open the **Layer Properties** window.

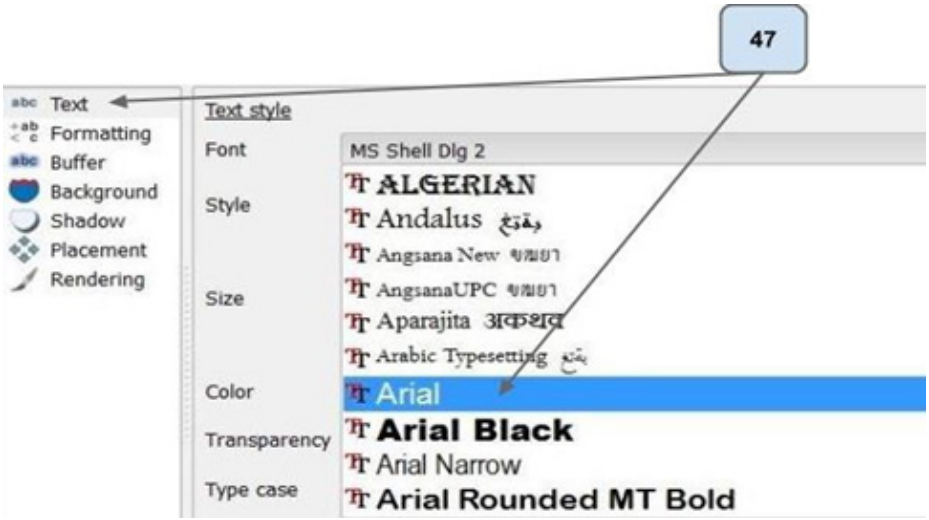
Step 45 – Click on the **Labels** tab and check the box next to **Label this layer with**.

Step 46 – In the drop down box select **Villages**.



**Now we are going to set the style on how the labels will appear in the map.*

Step 47 – Click on **Text** and in the drop down box change the **Font** to **Arial** or if you would like to use another font that is up to you.



Step 48 – Click on the drop down arrow to change the Style to Bold so that the labels are clear.

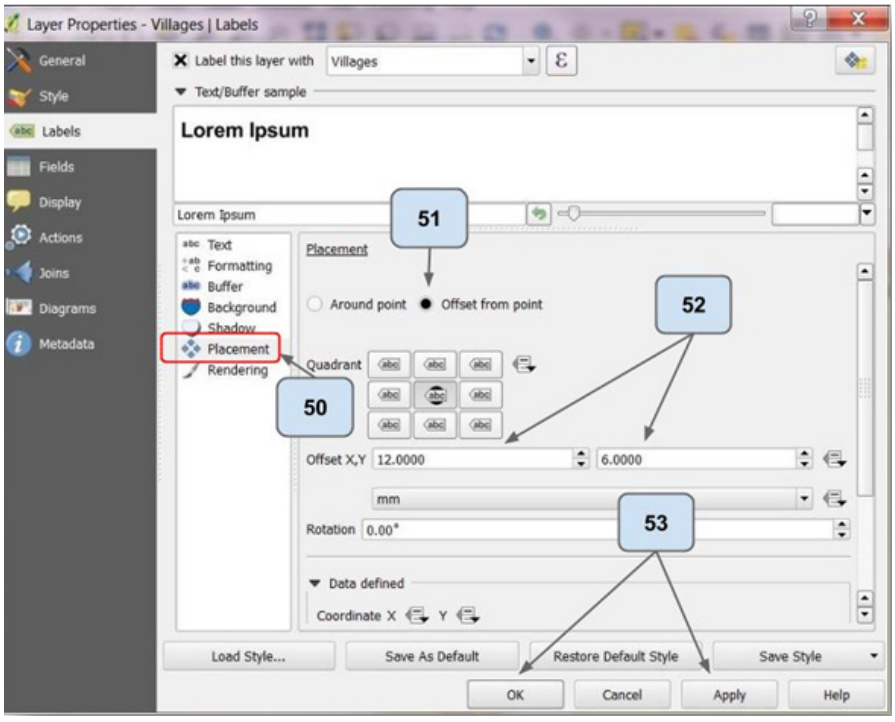
Step 49 – Change the Size to 12 by typing it in and leave the **Colour – Black**.

**Now, we are going to set how the label will be placed on the map. The labels will either be on top or around the point*.

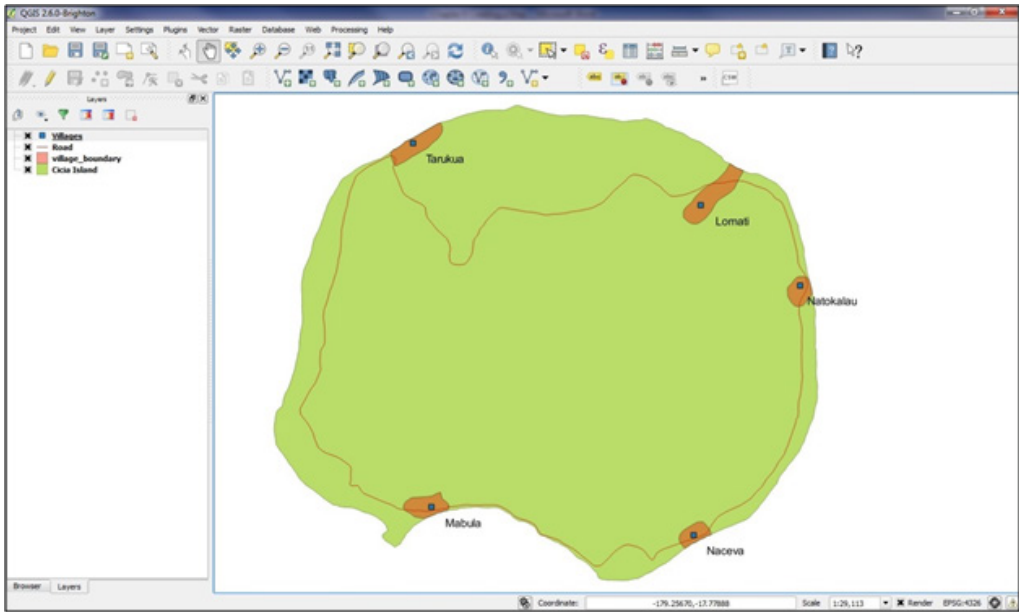
Step 50 – Click on **Placement** so that we can change the position of the label.

Step 51 – Select **Offset from point**.

Step 52 – In the **Offset X, Y** change the numbers to **12** and the other to **6**.
**This is the distance of the label from the point*.



Step 53 – Click **Apply** and then **OK**.
Your map should look similar to the image on the next page.



Step 55 – Use the **Pan map** tool  to move your map around the screen.

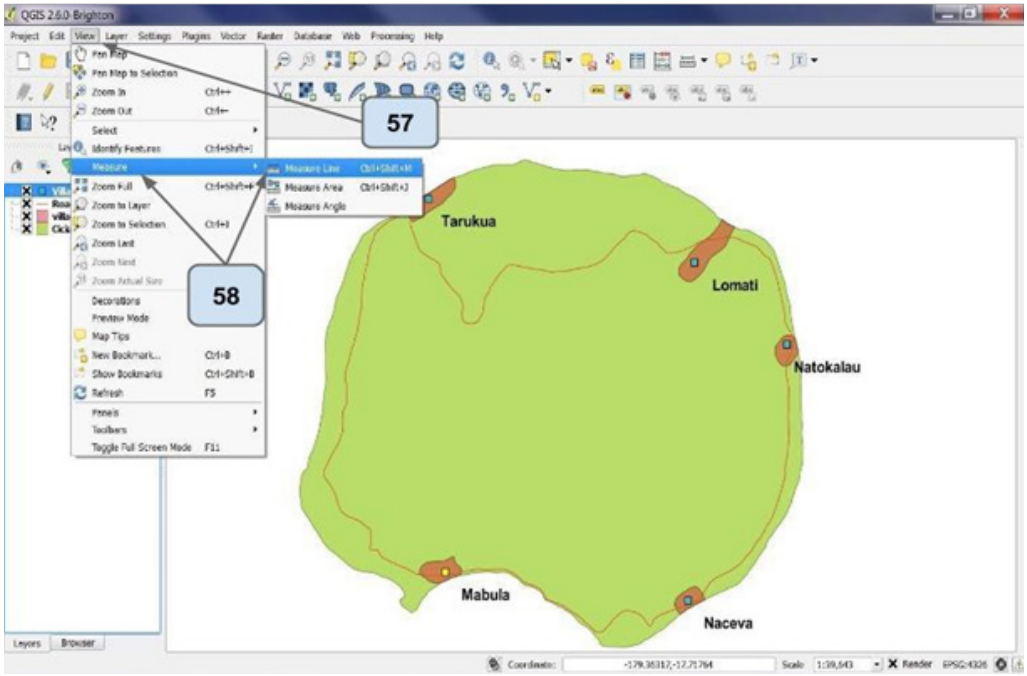
Step 56 – Zoom in and zoom out using the zoom tools  to see the features more closely. And then use the **zoom full**  tool to view the entire map again.

One interesting thing that you can also do on your map is measure the distance between places.

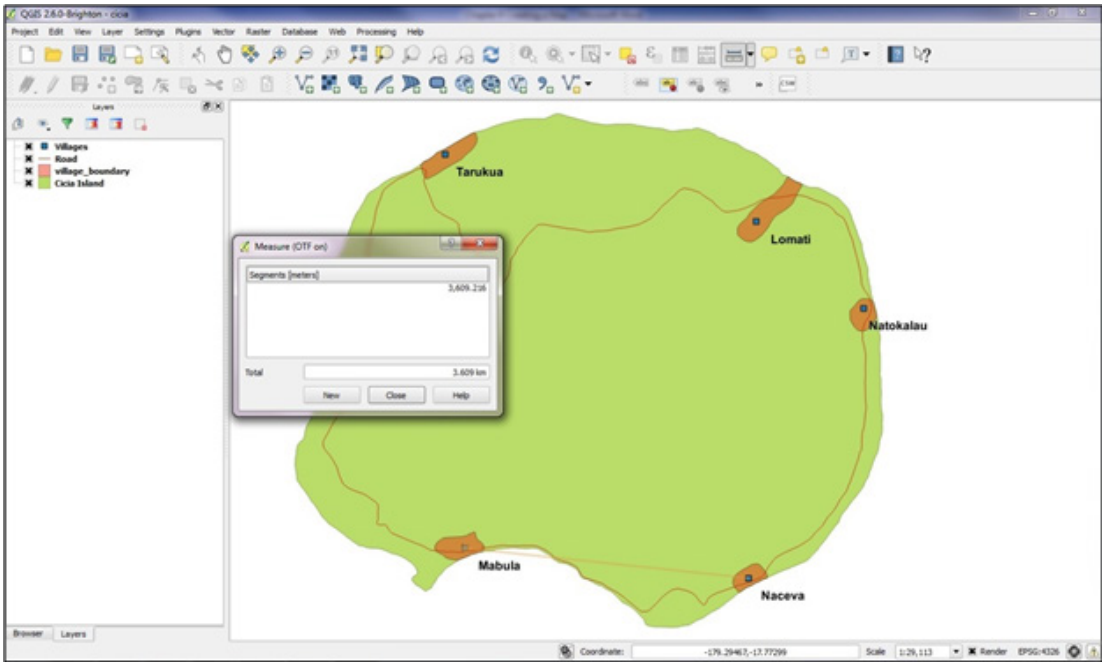
**Let's measure the distances between these villages.*

Step 57 – Go to View.

Step 58 – Click on **Measure** and select **Measure Line**.



Step 59 – On you map, click on the blue square representing Mabula village and move your mouse and click on top of Naceva village. You will notice the Measure window telling you the distance between the two villages.

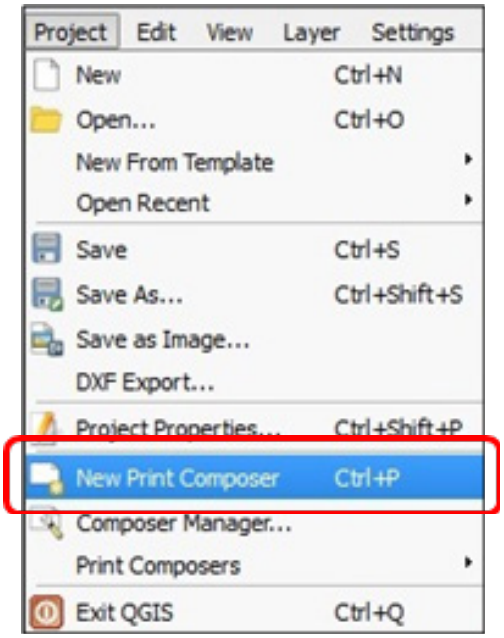


- What is the distance from Mabula to Naceva? Is this similar to the distance you measured on paper in Chapter 9?
- What is the distance from Mabula to Lomati?

10. 4 New Print Composer

Now that you know the distances between the villages, changed the symbols and labelled each village you are now ready to create the layout for your first map.

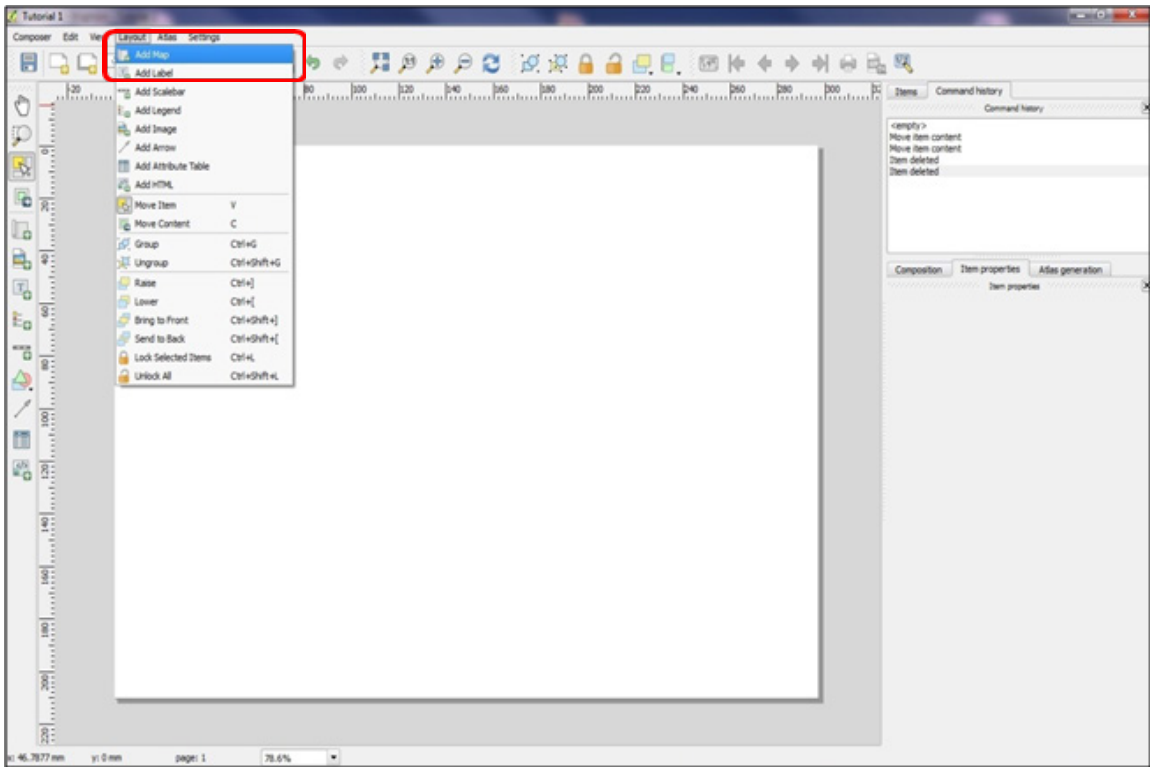
Step 60 – Go to **Project** and select **New Print Composer**.



Step 61 – Name your project **Tutorial 1** as shown below and then click **OK**. You can always give your maps different names depending on the map that you are creating.

A new map window will appear.

Step 62 – Go to **Layout** and select **Add Map**.



Step 63 – Place your mouse pointer on the top left hand corner of the white map canvas and drag it towards the bottom right hand corner to form a square. Once you reach the bottom right hand corner, let go of the mouse and your map should appear in the square you have created.

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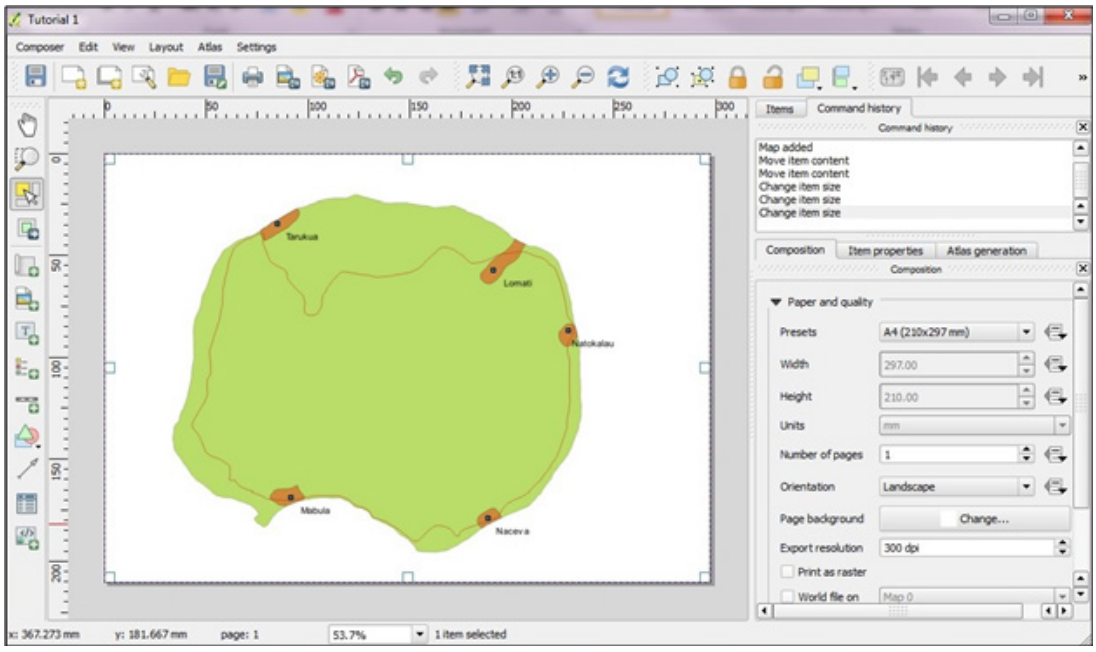
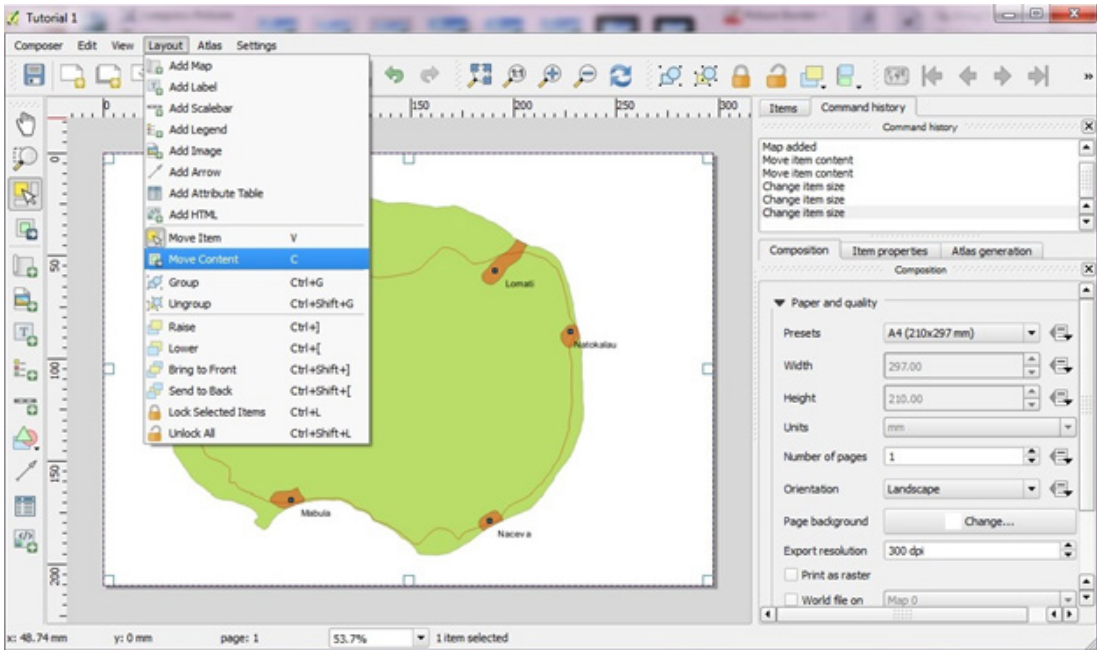


Step 64 – To move the map around click on **Move Content** and then with your mouse click and drag your map around so that it fits perfectly in the frame. You can move the map content either up, down or sideways.

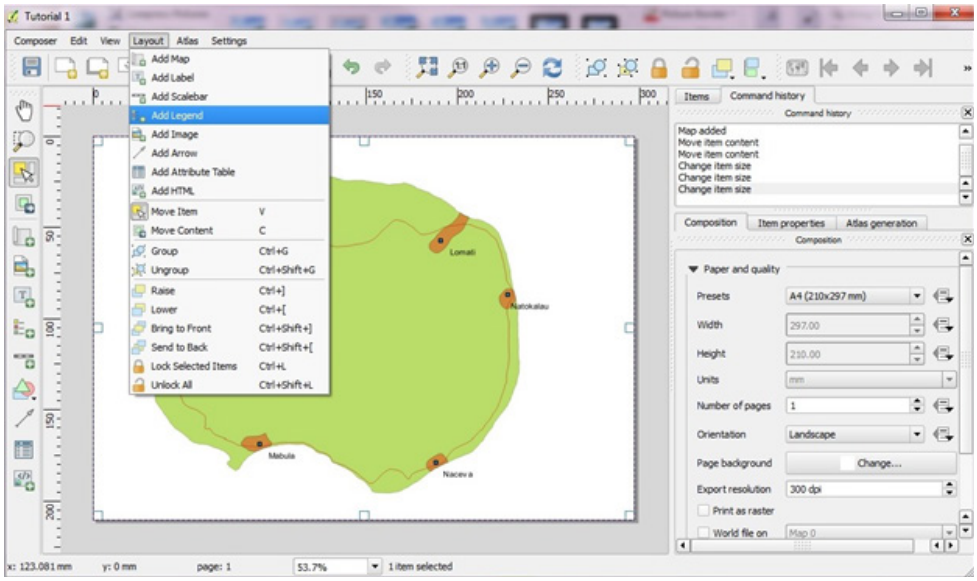


Adding a Legend

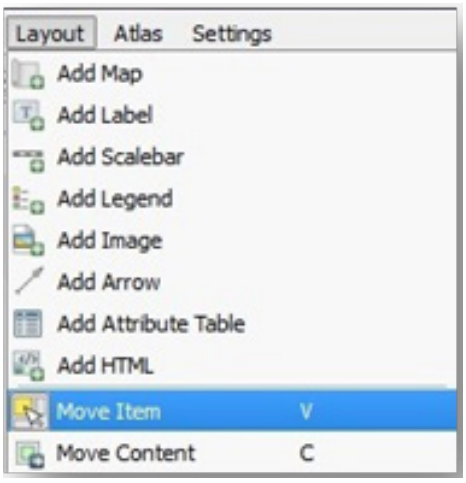
Add a **Legend (key)** to your map. A Legend is one of the most important parts of any map. It tells you what the colours, numbers, points, lines and polygons on the map are or what they mean. Every map should have a legend so people can understand your map.

Step 65 – Go to **Layout** and click on the **Add Legend** tool.

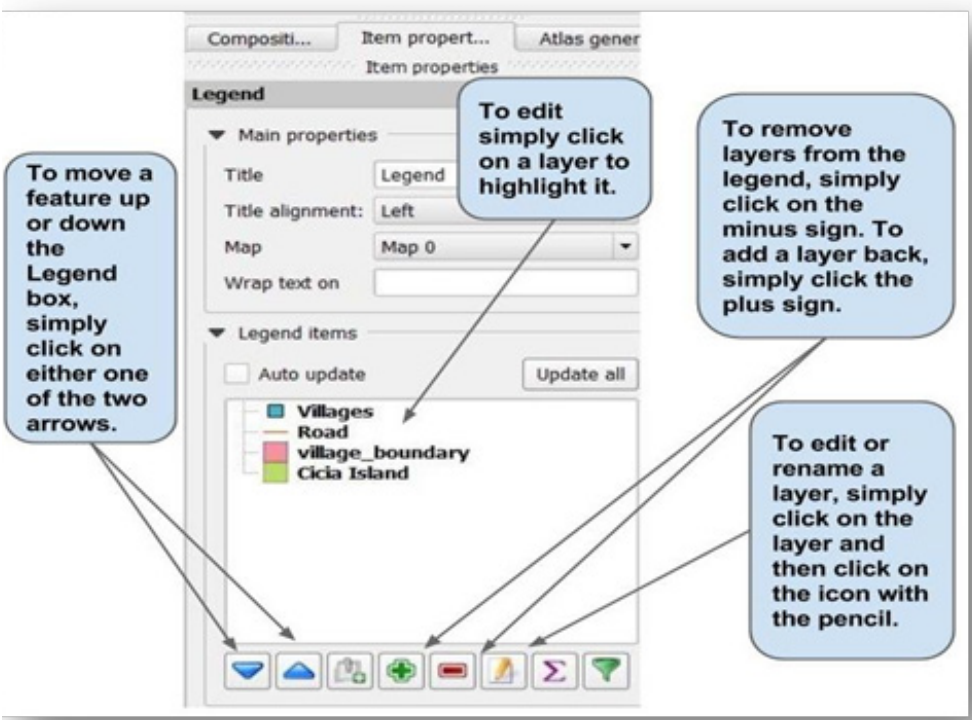
Step 66 – With your mouse draw a square on the bottom right hand corner of your map to display your legend.



Step 67 – To move the Legend around, click on Move Item and move the legend either up, down, left or right.



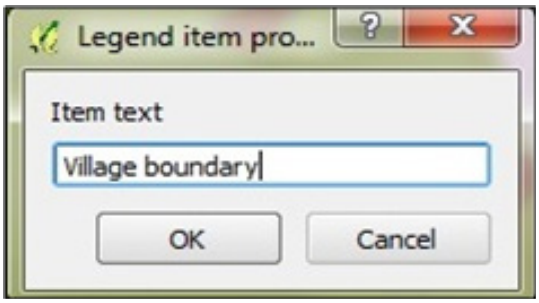
To edit your Legend, click on the Legend to highlight it and then click on the Item properties on the right hand corner of your map.



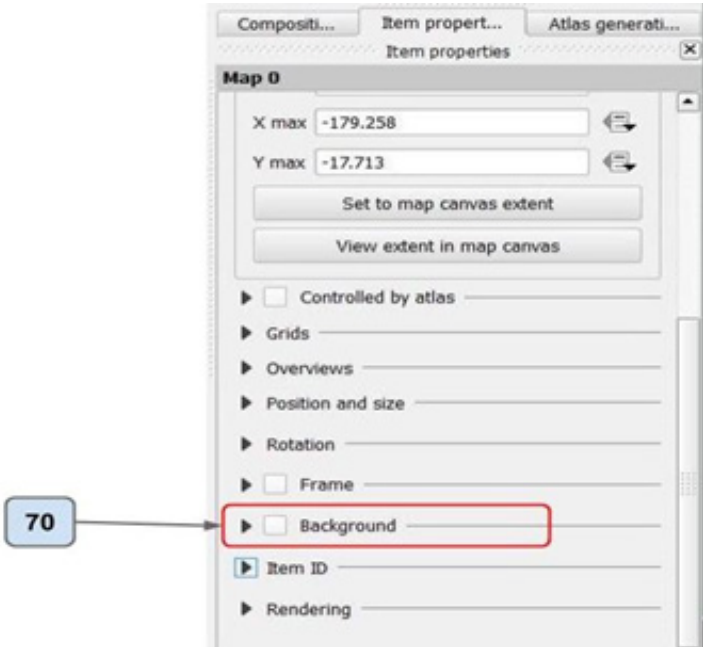
Step 67 – Let's edit the name for the village_boundary. To be able to edit the Legend, always make sure to remove the **x** next to the box that says **Auto update**.

Step 68 – Select the layer **village_boundary** by clicking on it.

Step 69 – Click on the *edit text* icon  . Type in **Village boundary** and then click **OK**.



Step 70 – Remove the x in the box next to **Background** to remove the background for the legend.

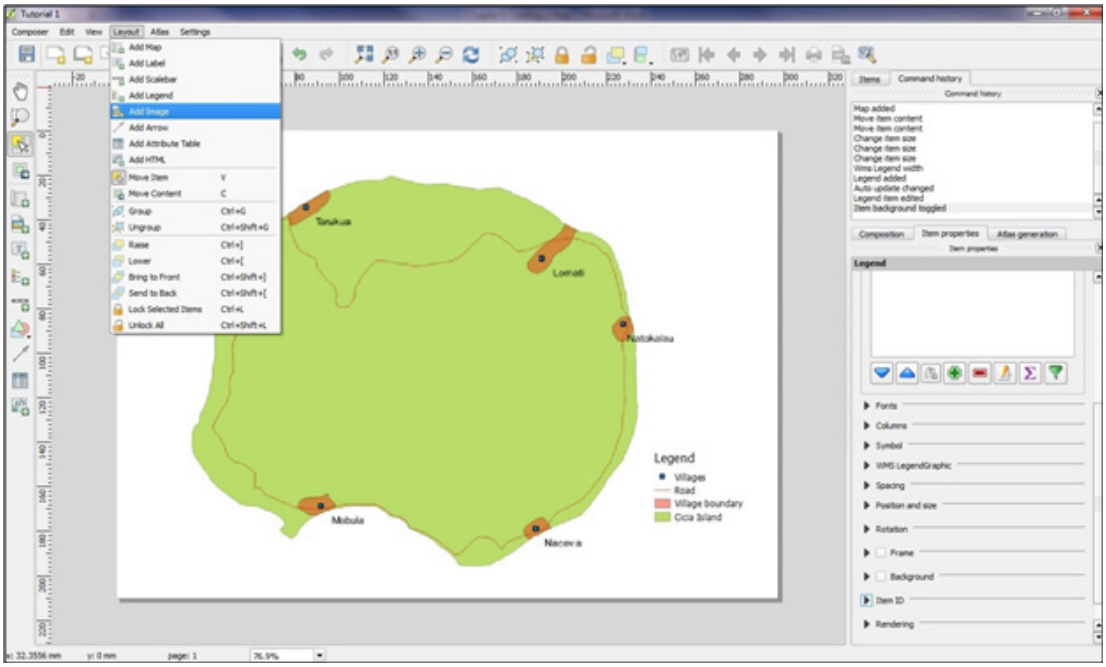


Adding a North Arrow

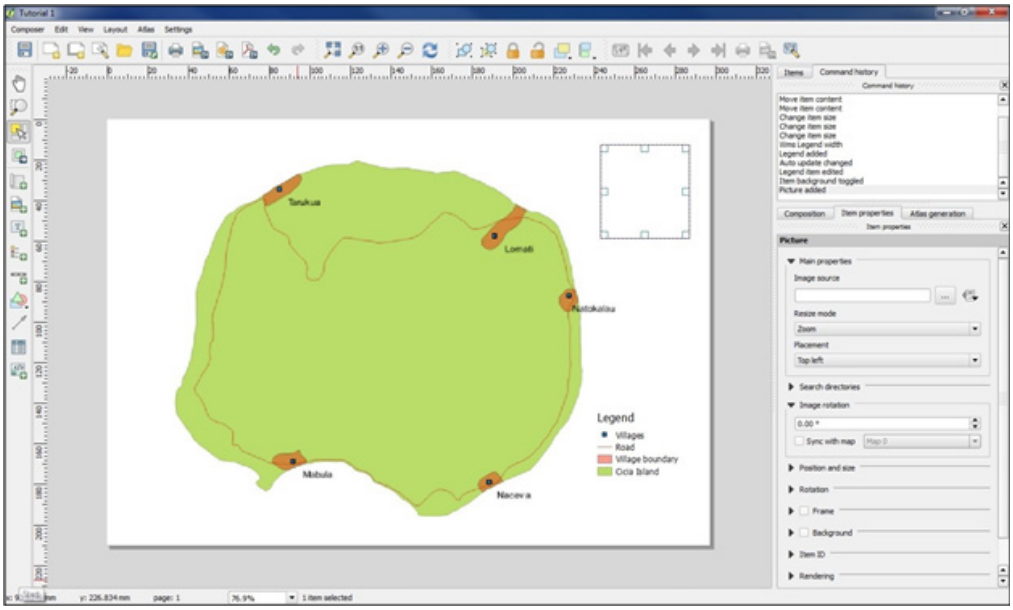
We are now going to add a North Arrow.

The North arrow tells us which way is north on your map. There are many symbols for the north arrow, but you always want to keep everything simple.

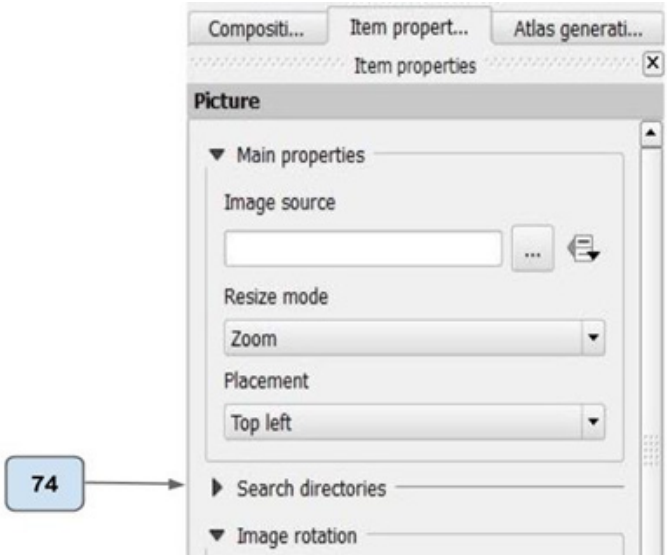
Step 71 – Go to **Layout** and select **Add Image**.



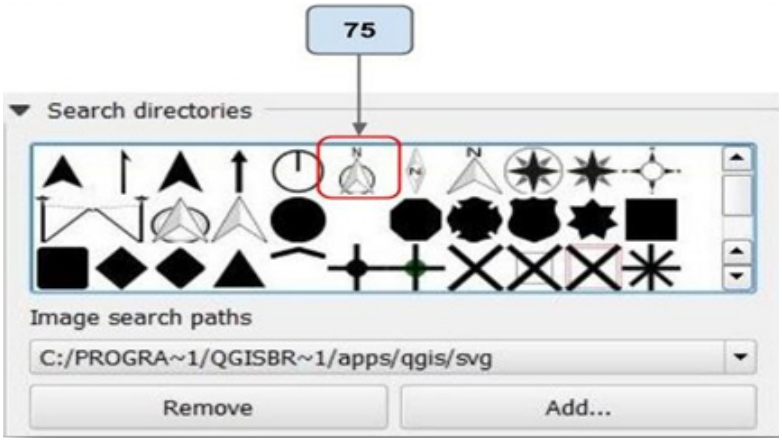
Step 72 – Draw a small square in the top right hand corner.



Step 73 – Go to **Item Properties** and click on the arrow next to **Search directories**.



Step 75 – Wait for a while for the images to load and then scroll down the list and click on the north arrow with a ring around it and an N at the top. (Note, you can use any of the images but for this exercise lets choose the North arrow selected below).



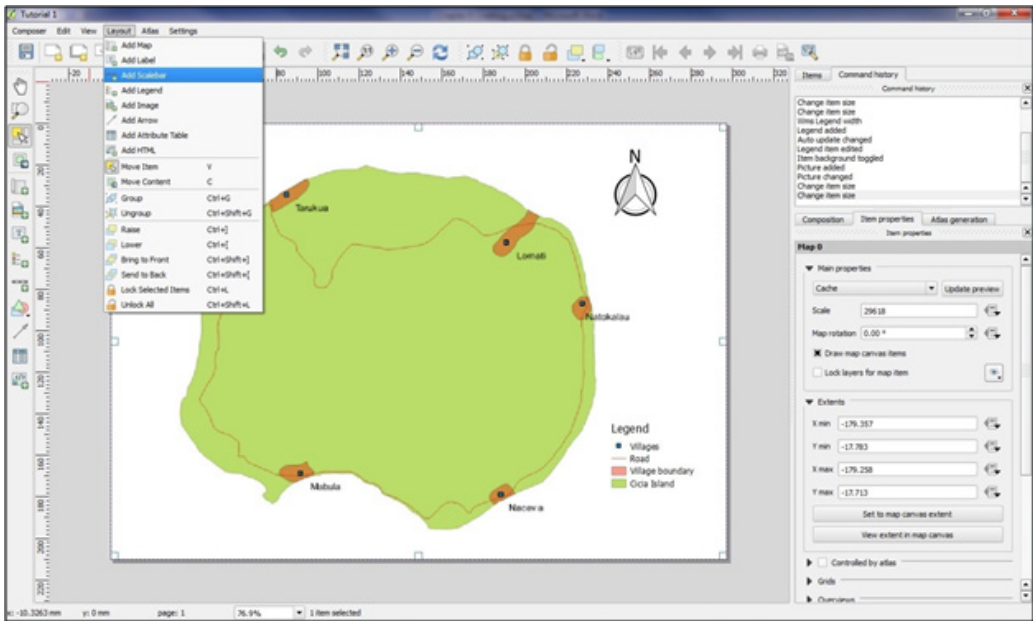
Step 76 – Make the size of the North Arrow smaller by moving the end of the box you created further in. Once it is small enough then you can add a scale bar.

Adding a scale bar.

Now we will add a scale bar. One of the first few things you learnt about the QGIS interface was scale. In any map, it is important to have a scale so that anyone reading your map will know that 1 unit on the map is equal to how many of that unit on the ground. For example, 1 cm on the map may be equal to 500,000 cm in real life.

Step 77 – Go to **Layout** and click on **Add scale bar**.

Step 78 – Click on the bott om left hand corner of your map.



Step 79 – You should now see a scale bar at the bottom left hand corner of your map. Click on the scale bar so you can edit its properties.

In the **Item properties** on the right hand side, check that:

Step 79 a – the units of measurement, is in Meters.

Step 79 b – You can type in km so that your scale will be measured and labelled in kilometres. Note if you are mapping your village or community at a smaller scale you may leave it at metres.

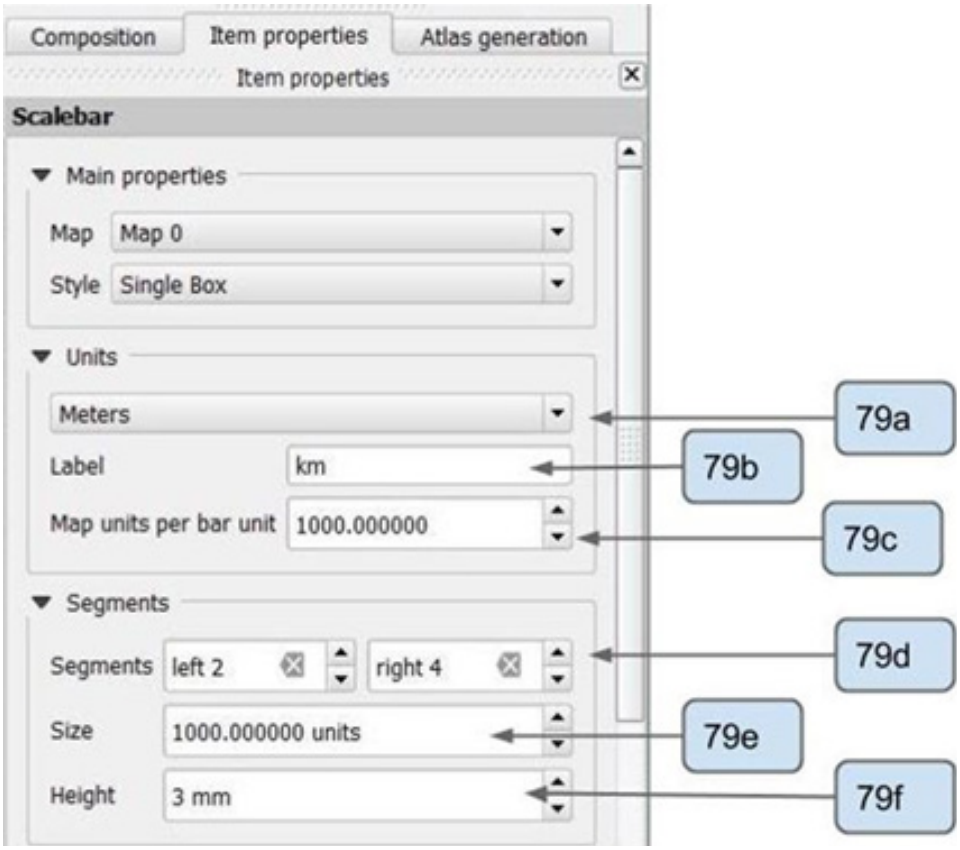
Step 79 c – By default, the units will adjust so that 1000 metres equals a kilometre.

Step 79 d – You change the number of segments or parts your scale bar should have. You can experiment with this and then set it to Left 0, Right 2 (this will make it simple)

Step 79 e – This is where you set the size of the units. Leave it at 1000.

Step 79 f – Height, You can change the height of the scale to 2 by clicking on the arrows.

Note: You can use different properties, however it is good to keep your map simple.

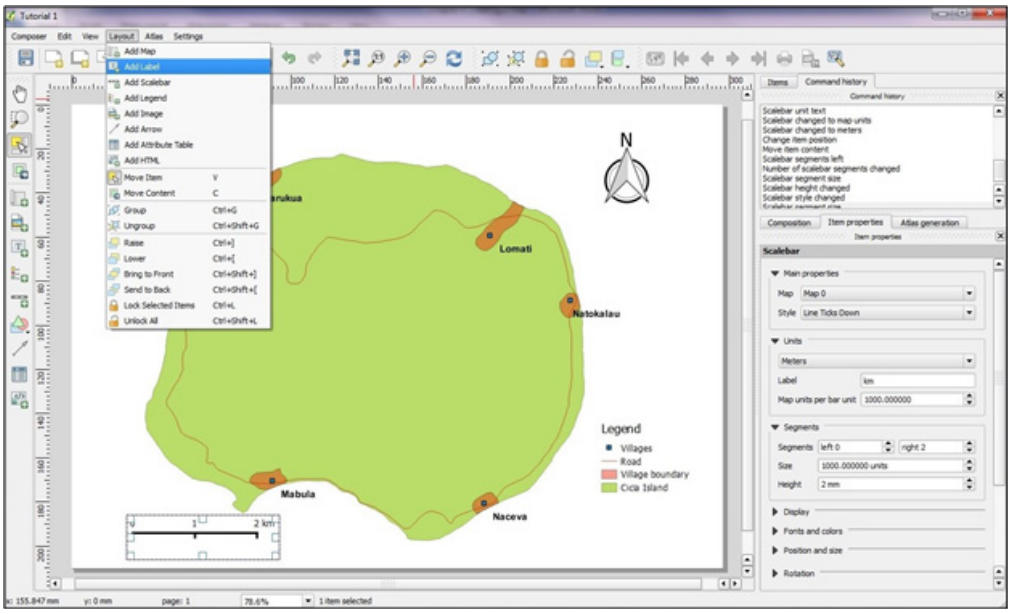


**You can experiment with the scale bar properties, don't worry you will not break anything. If you make a mistake you can always start again!*

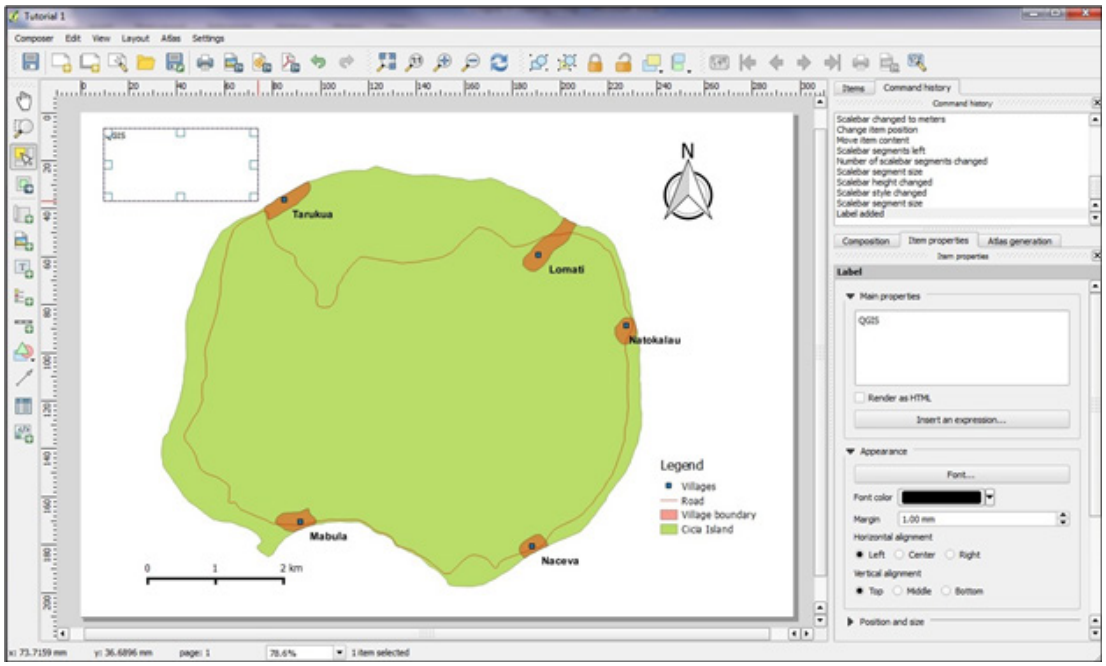
Adding a Title

Now we are going to add the title. The title is the most important part of the map, because it tells the reader what the map is about.

Step 80 – Go to Layout and select Add Label.

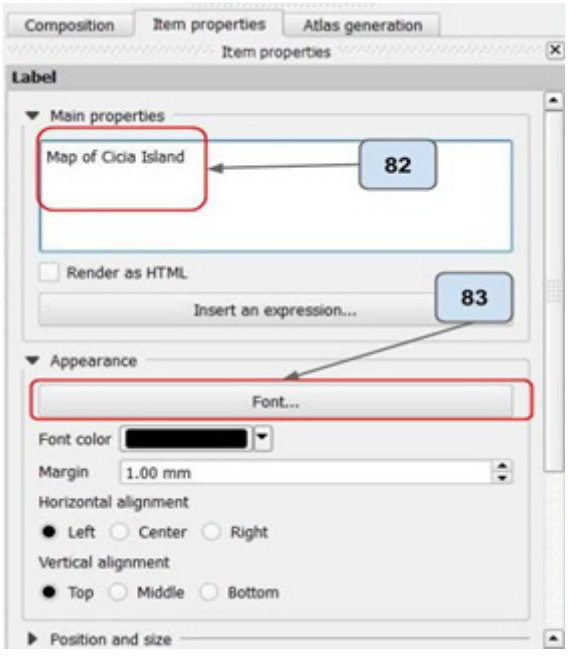


Step 81 – Draw a square in the top left hand corner. You may place your title anywhere on your map but you must be careful as you want the reader to be able to read it.



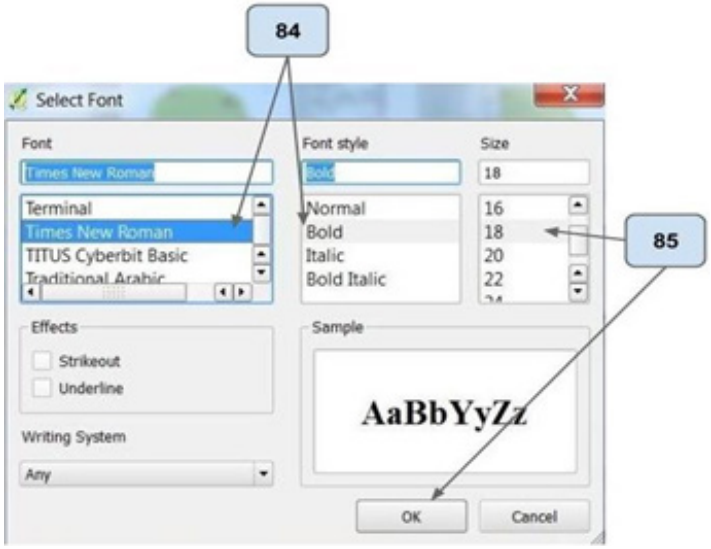
Step 82 – In the Item properties tab, type in **Map of Cicia Island** as shown below.

Step 83 – Click on **Font**.



Step 84 – Change the **Font** to Times New Roman (or any font you like) by searching in the list and then change the **Font style** to **Bold**

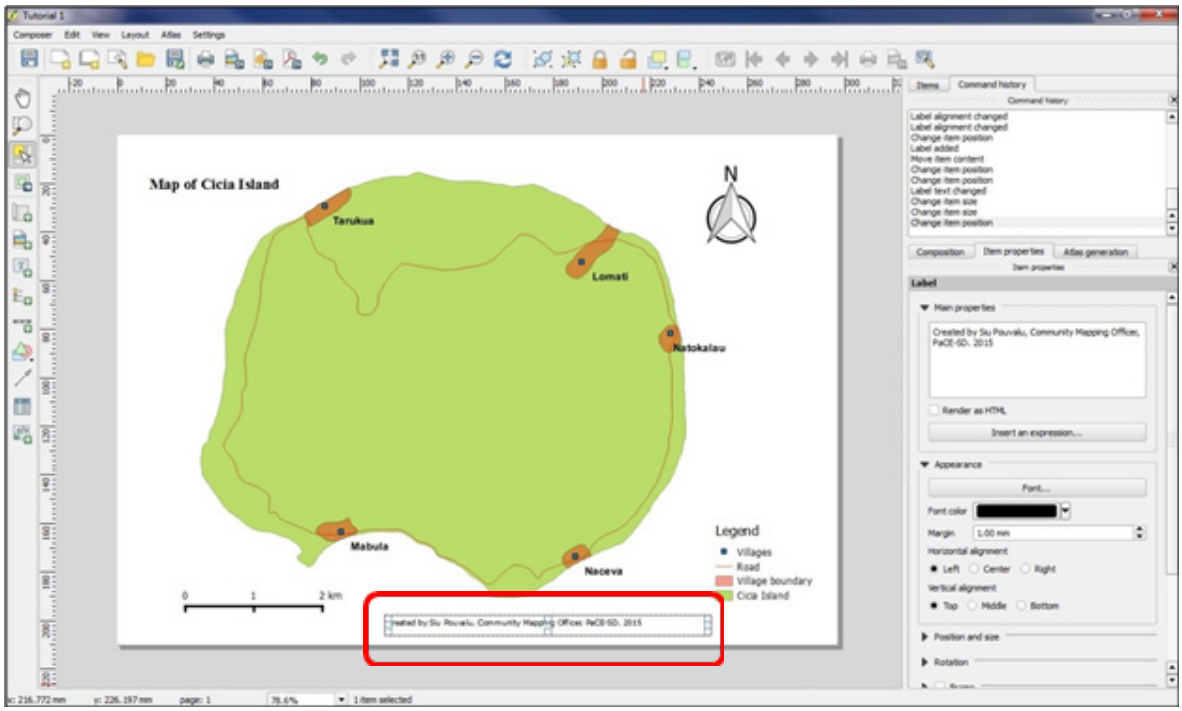
Step 85 – Change the **Size** to 18 and then click **OK**.



Step 86 – You will now put your name as the creator of this map. Add another label and add it at the bottom of the map between the scale and legend.

Step 87 – In the Label section type the following:

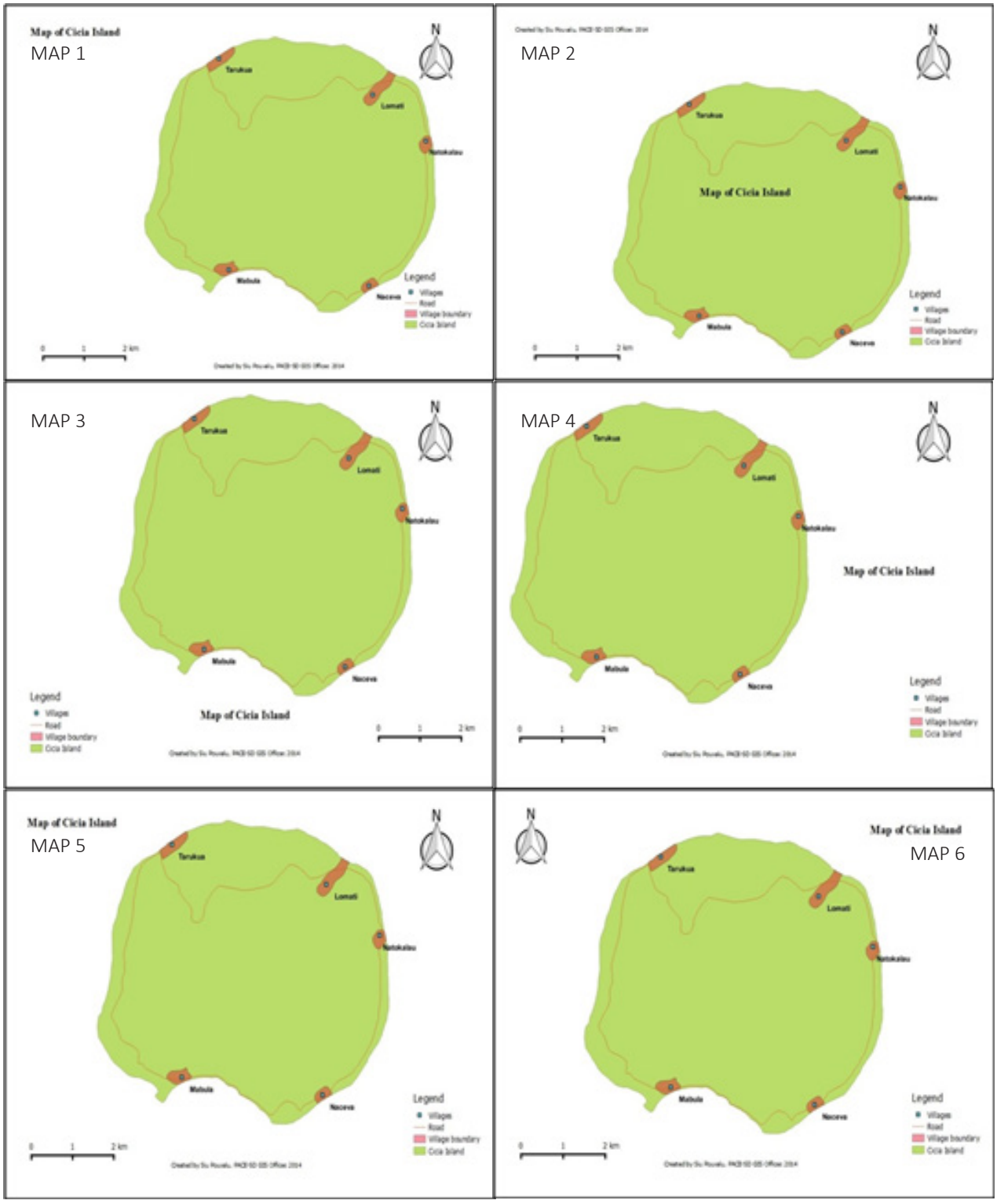
Created by (your name), (name of your community)
Community Mapping Officer. 2014.



Step 88 – Drag one end of the label box so that the text becomes one line. You can move the features in your map around so that it is well balanced.

Use the **Move item content**  to move the map and use the **select/move item**  to move the title, north arrow, legend, scale and the label. You may move the features on your map around so that everything is balanced.

Take a look at the maps below, which map has a more balanced layout?? Which map uses space better?

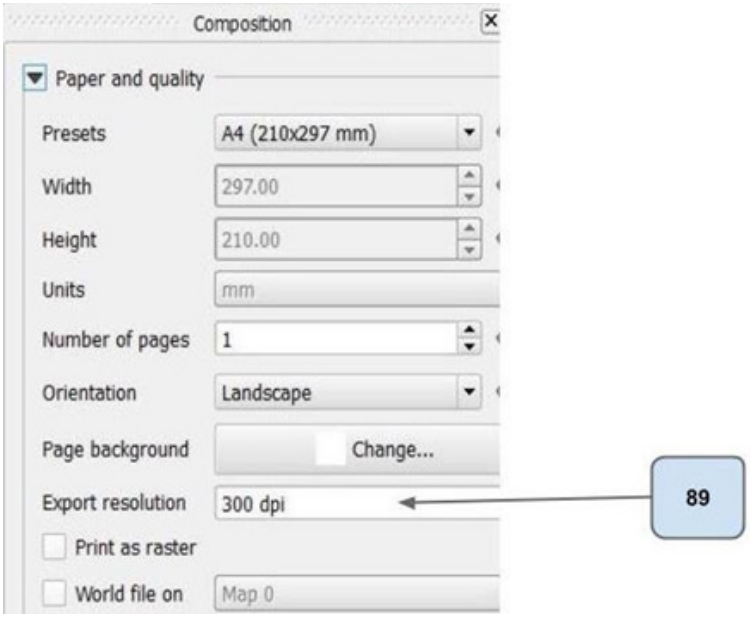


Make sure that your map does not leave too many empty spaces or is too crowded.

Map 1 – 3 have unbalanced features. There is a lot of empty unused space.
Map 4 – Can be improved as it looks unbalanced.
Map 5 & 6 – Well balanced!

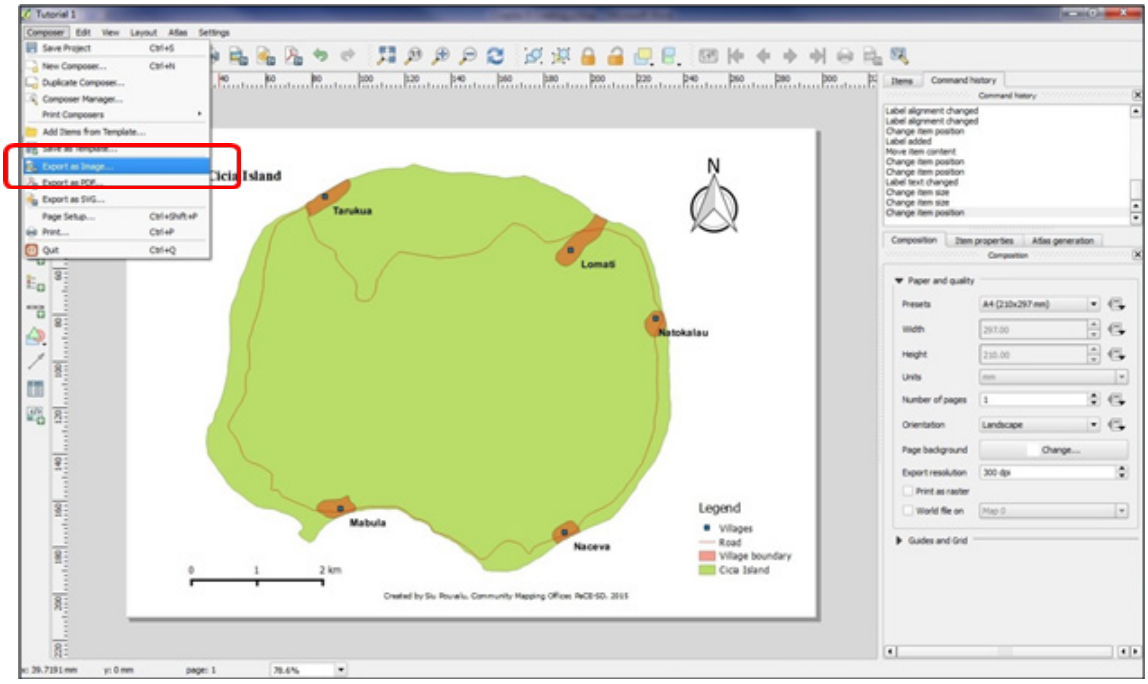
If your map is unbalanced move the features around to balance it.

Step 89 – Click on the Composition tab and set the Export Resolution to 300 dpi. This will make sure your image is of good quality.

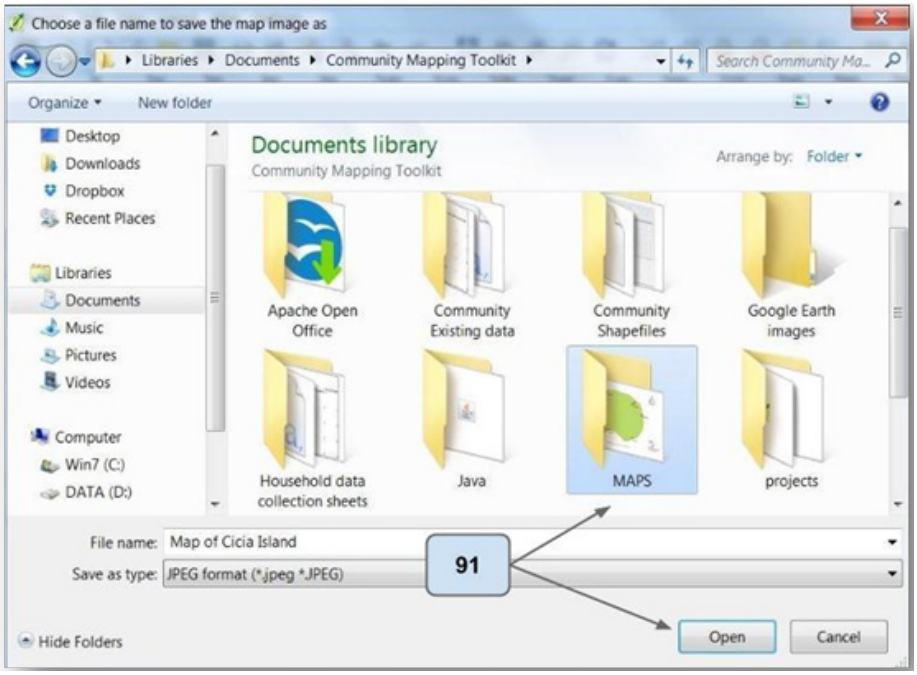


10. 5 Saving your map.

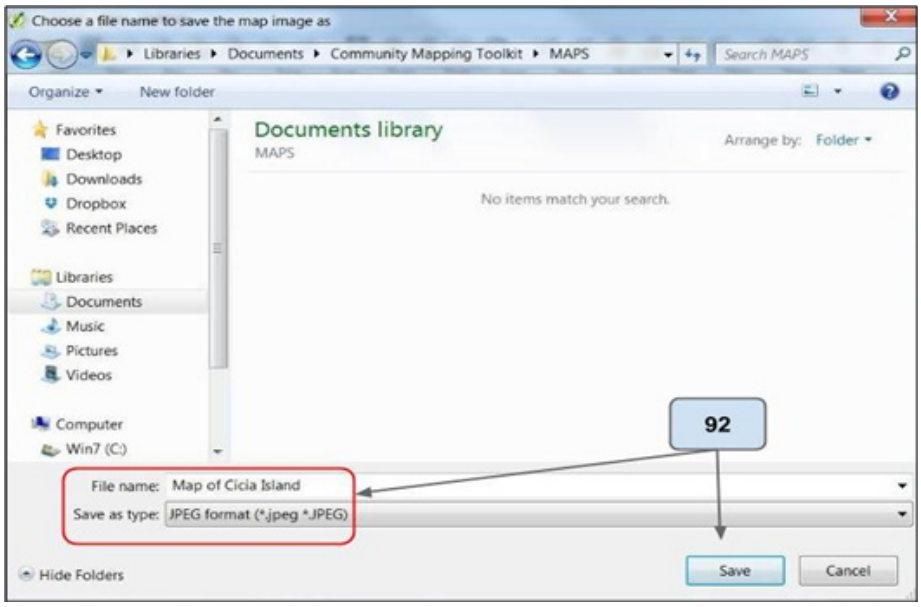
Step 90 – Go to **Composer** and select **Export as image**.



Step 91 – Go to your document folder and open the **Community Mapping Toolkit** folder. Click on the **MAPS** folder and click **Open**.



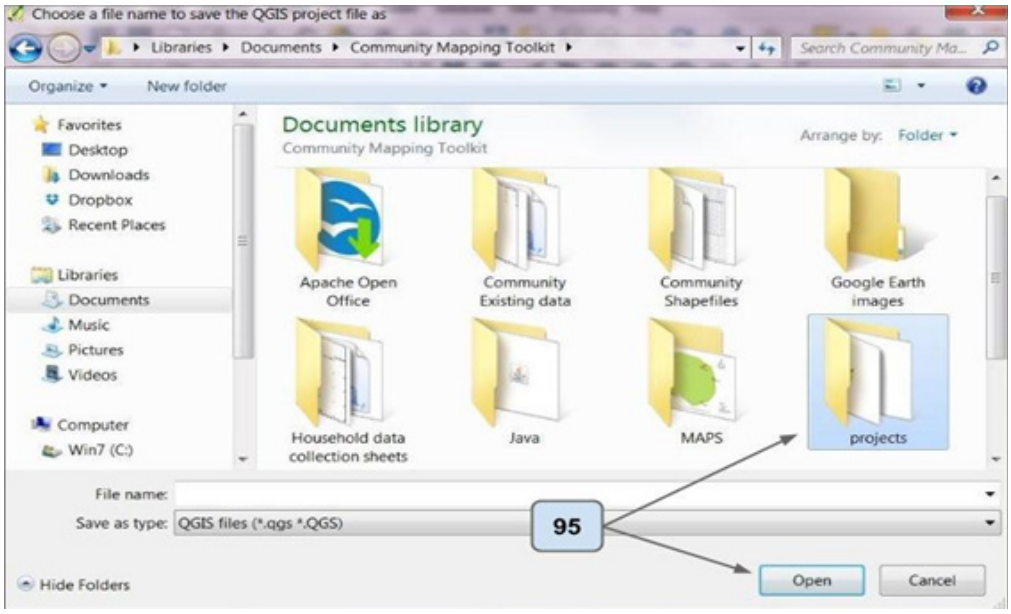
Step 92 – Name the file **Map of Cicia Island** and make sure the **Save as type: JPEG format** and then click **Save**.



Step 93 – On QGIS, go to **Composer** and select **Save Projec**t. Close window.

Step 94 – On the QGIS Desktop, go to **Project** and select **Save As**. This allows you to save the map project you are working with, so that if you want to work with it later you can always work on it later.

Step 95 – In the **Community Mapping Toolkit** folder, click on the **Projects** folder and select **Open**.



Step 96 – Save the file name Map of Cicia Island. You can now close QGIS.

**When making maps, always keep it simple. Do not have too many layers on one map as it will be confusing to read. If there are a lot of things you want to show, it is best to create more than one map. That way, it will be easier for you and other people to read.*

10. 6 Open and save a Project

Now we are going to open the Project that you have just saved.

Step 97 – Start QGIS again.

Step 98 – Go to **Project** in the top left hand corner and select **Open**.

Step 99 – Once the **Choose a QGIS project file to open**...window pops up, go to the **Projects** folder and select the **Map of Cicia Island** project that you just saved.

Step 100 – You will see the same map project you worked on will appear. So whenever, you want to work on the project you can open it again. You can do the same for any other project you will work on. Close QGIS and select **Discard**.

Congratulations

you have successfully created a map using geospatial data and QGIS! You are also familiar with saving a project and how to open it again.

Chapter 11 will guide you on how to create an ecosystem map.

Chapter 11– Creating an Ecosystem Map

Objectives:

By the end of this Chapter, you should be able to:

- Create a map of an ecosystem using existing data in QGIS
- Create a database
- Create shapefiles
- Edit shapefiles
- Create multiple attribute and symbols

This chapter is divided into six sections:

14.1 Creating a database
14.2 Creating polygon shapefiles
14.3 Symbolizing
14.4 Creating a point shapefile
14.5 Creating a line shapefile
14.6 Creating a map

**To watch the video tutorial for this chapter, open the video file named Chapter 11- Creating an ecosystem map*.

11.1 – Creating a database

Step 1 – Go to the **Community Mapping Tool-kit** folder and open the **Tutorial data** folder. There should be a folder named **Nukulau**. Inside this folder you will find an image of the island of Nukulau in Fiji. For this chapter you will be working with this image. Close this window.

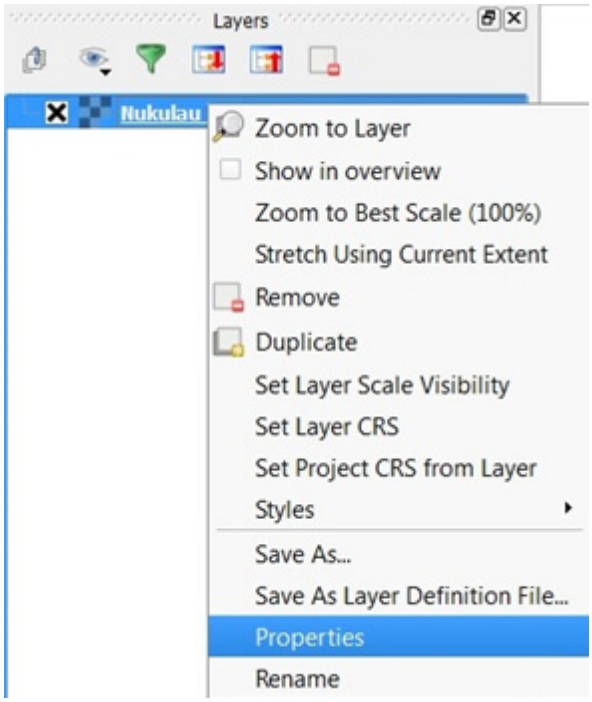
Before we start, we are going to create a **geodatabase**. A geodatabase is like a storage container where all your shapefiles and data will be stored. The good thing about saving your data in a geodatabase is that everything will be saved in one location so that it is not all over the place and easier to be copied from one location to another.

Step 2 – Start **QGIS**.

Step 3 – In the toolbar, click on the **Add Raster** layer and go to where the image of Nukulau is saved and add it to your map.

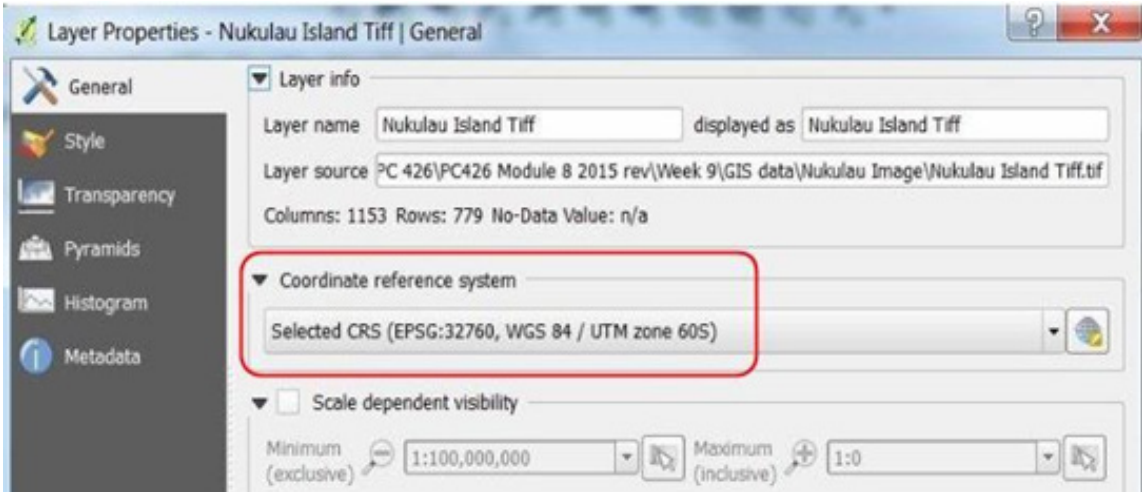
Now that you have an image, we will use it as a **base map to create some shapefiles. A base map is simply an image of a place that we can use to create points, lines and polygons to create our map*.

Step 4 – In the layers window, right click on the Nukulau Island image and select **Properties**.

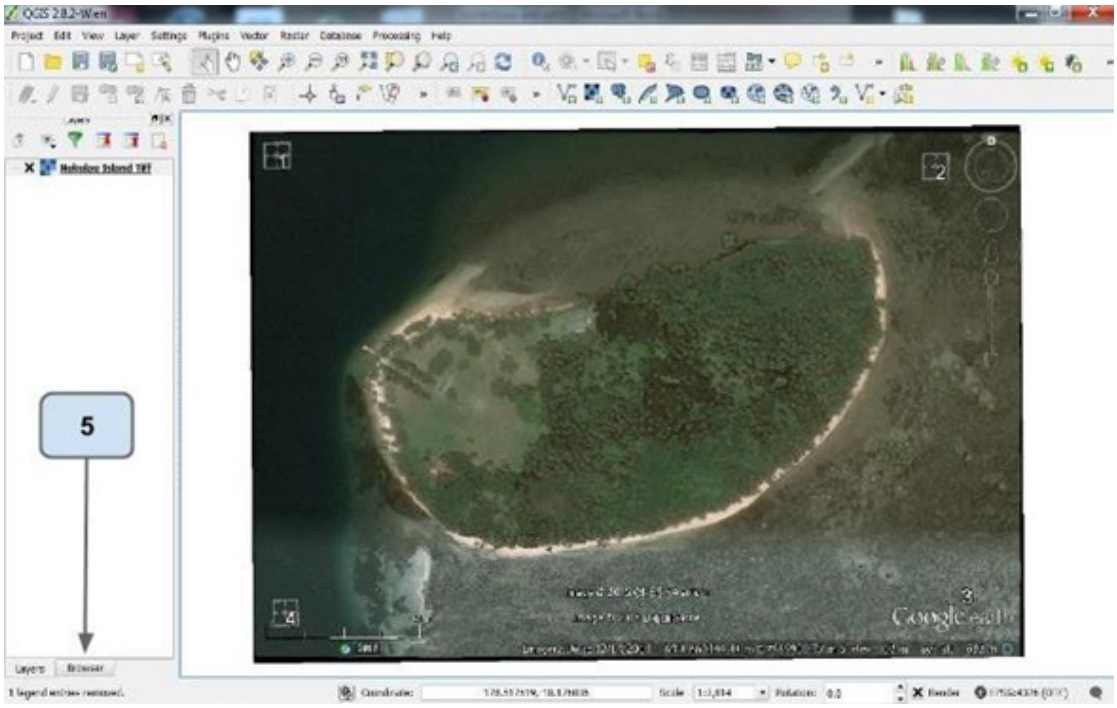


Step 4 a – Click on the General tab and look at the Coordinate reference system. It should tell you that this image is using the WGS 84 / UTM coordinate system. Zone 60 S means that this island is in zone 60 and is South of the Equator.

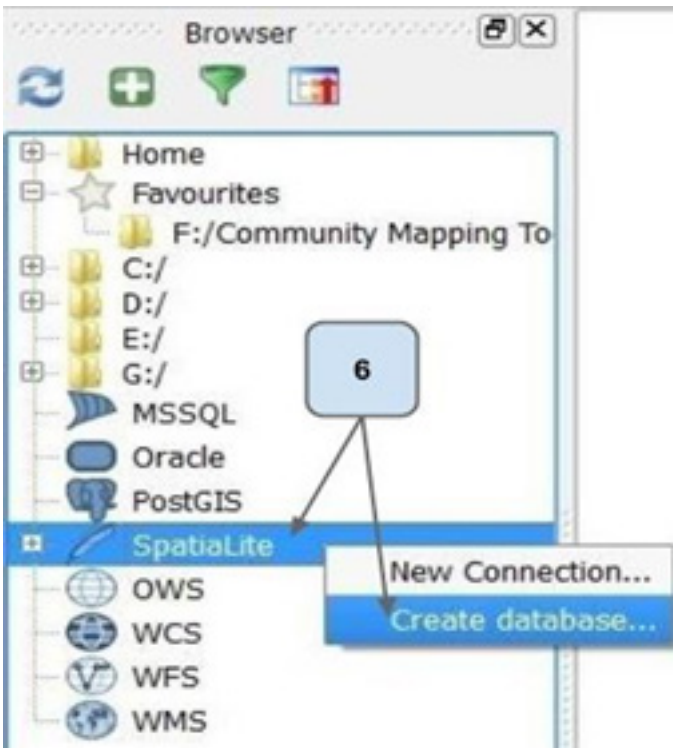
Step 4 b – Close this window.
**You will need to remember this (WGS 84/UTM zone 60 S) when you are creating your shapefiles*.



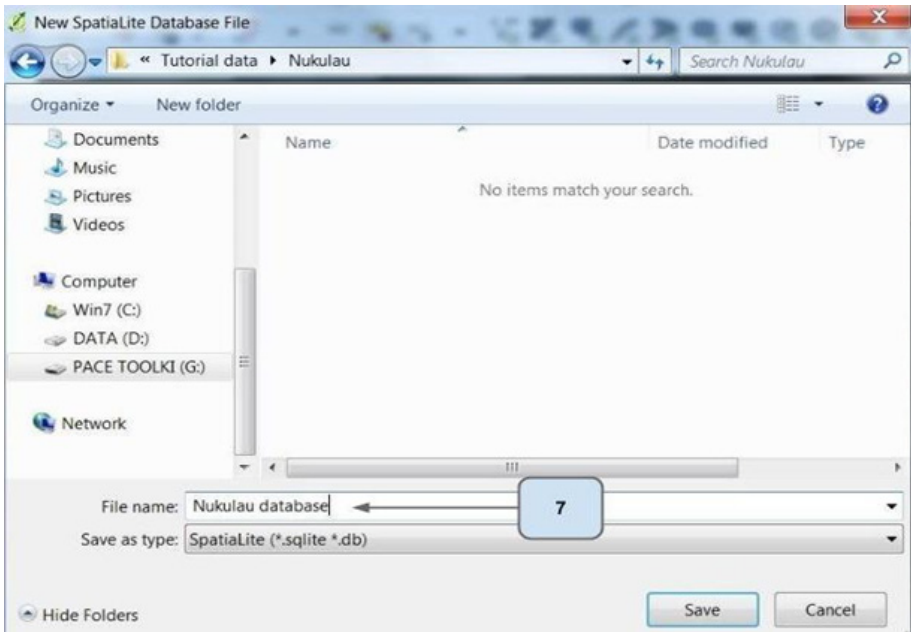
Step 5 – Click on the **Browser** tab.



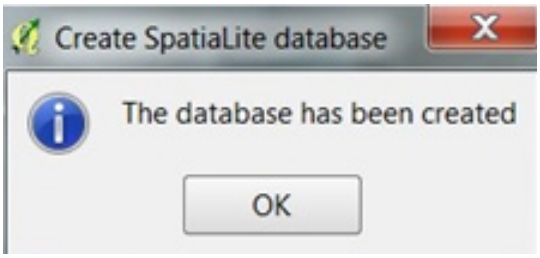
Step 6 – Right click on **SpatiaLite** and select **Create database**.



Step 7 – Save your new database in the **Nukulau** folder (in the **Tutorial data** folder) and name it **Nukulau database**.

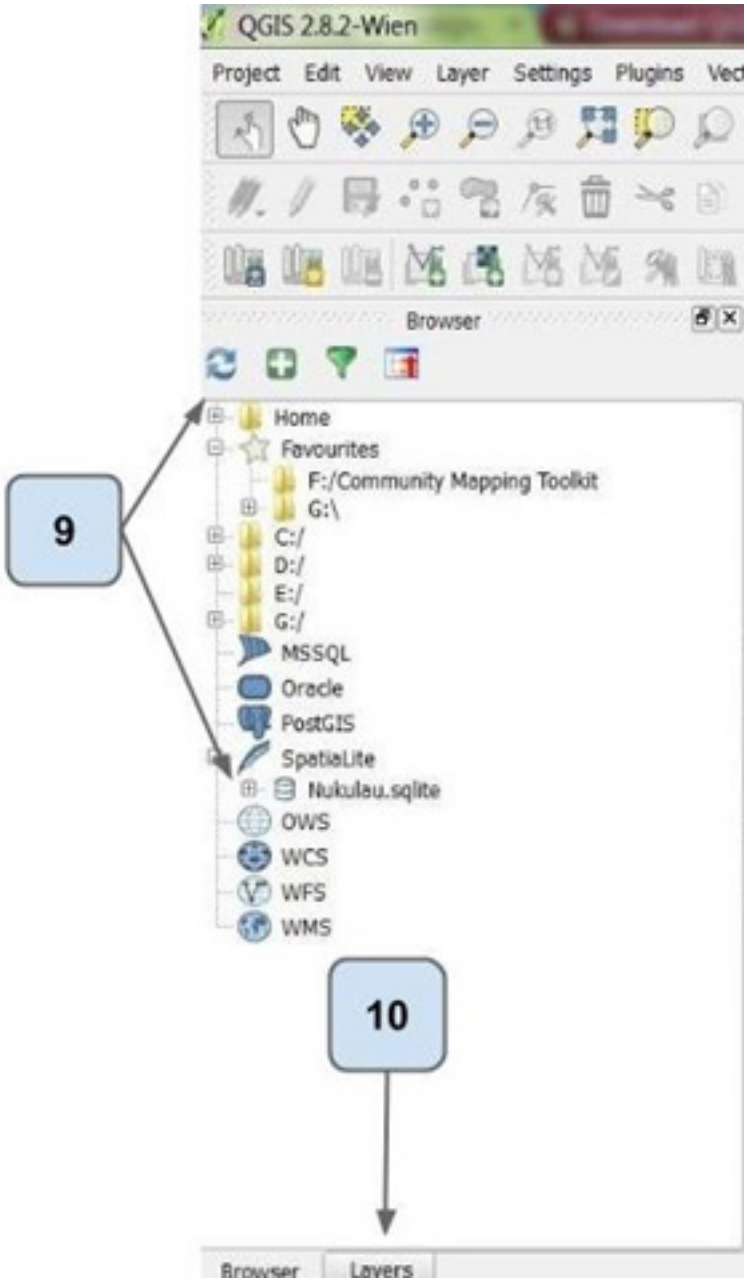


Step 8 – Click OK once the database is created.



Step 9 – Click on the Refresh button and then click on the plus sign next to **SpatiaLite** and you will notice the **Nukulau database.sqlite** has been created.

Step 10 – Click on the **Layers** tab so that when you create your new shapefiles you can see it in the layers window.



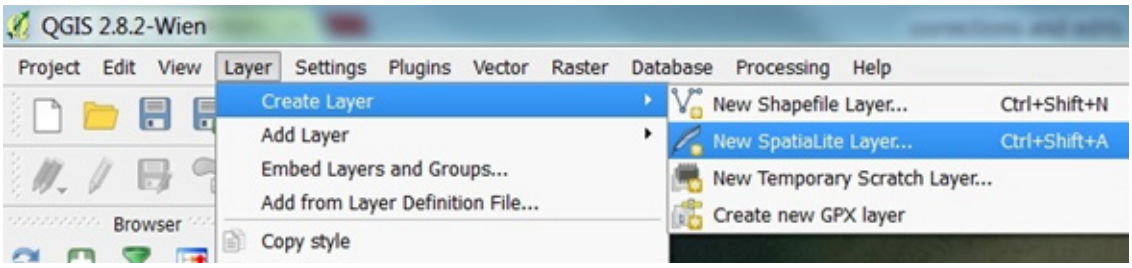
Congratulations

You have successfully created a geodatabase to store all the new shapefiles you will be creating for this chapter only.

**You can create another geodatabase for your community once you have collected your own data*.

11.2 – Creating polygon shapefiles

Step 11 – Go to **Layer, Create Layer** and select **New SpatiaLite Layer**.
Remember that the database that you created is under SpatiaLite, so if you want your new shapefiles to be saved in that database you create a **new spatialite layer.*

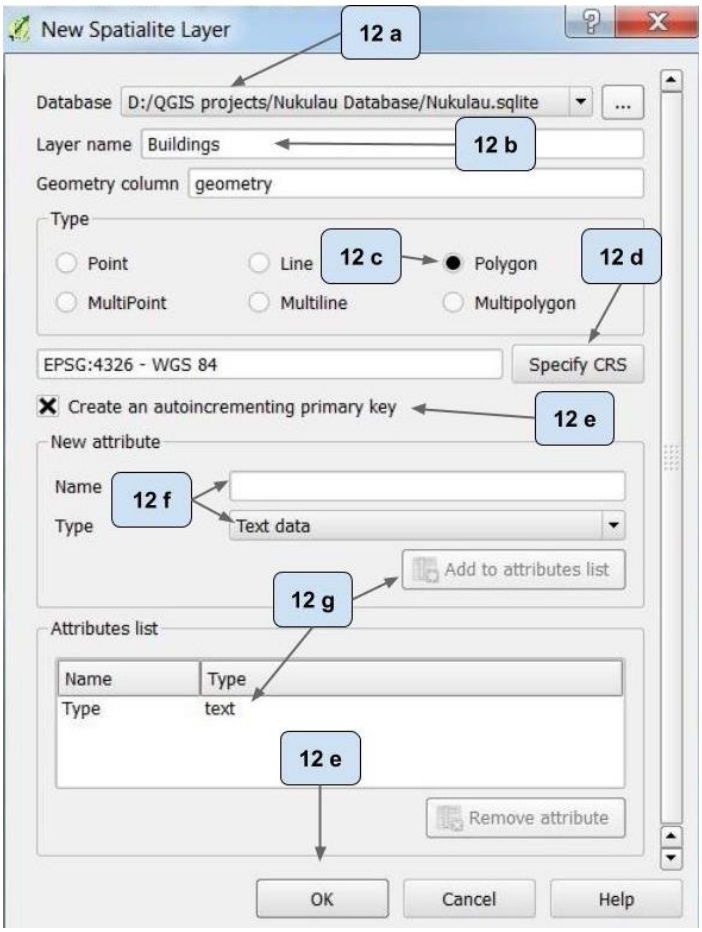


Step 12 – The New SpatiLite Layer window will appear. Fill in the following details.

12 a – Make sure your shapefile will be stored in the database that you created.

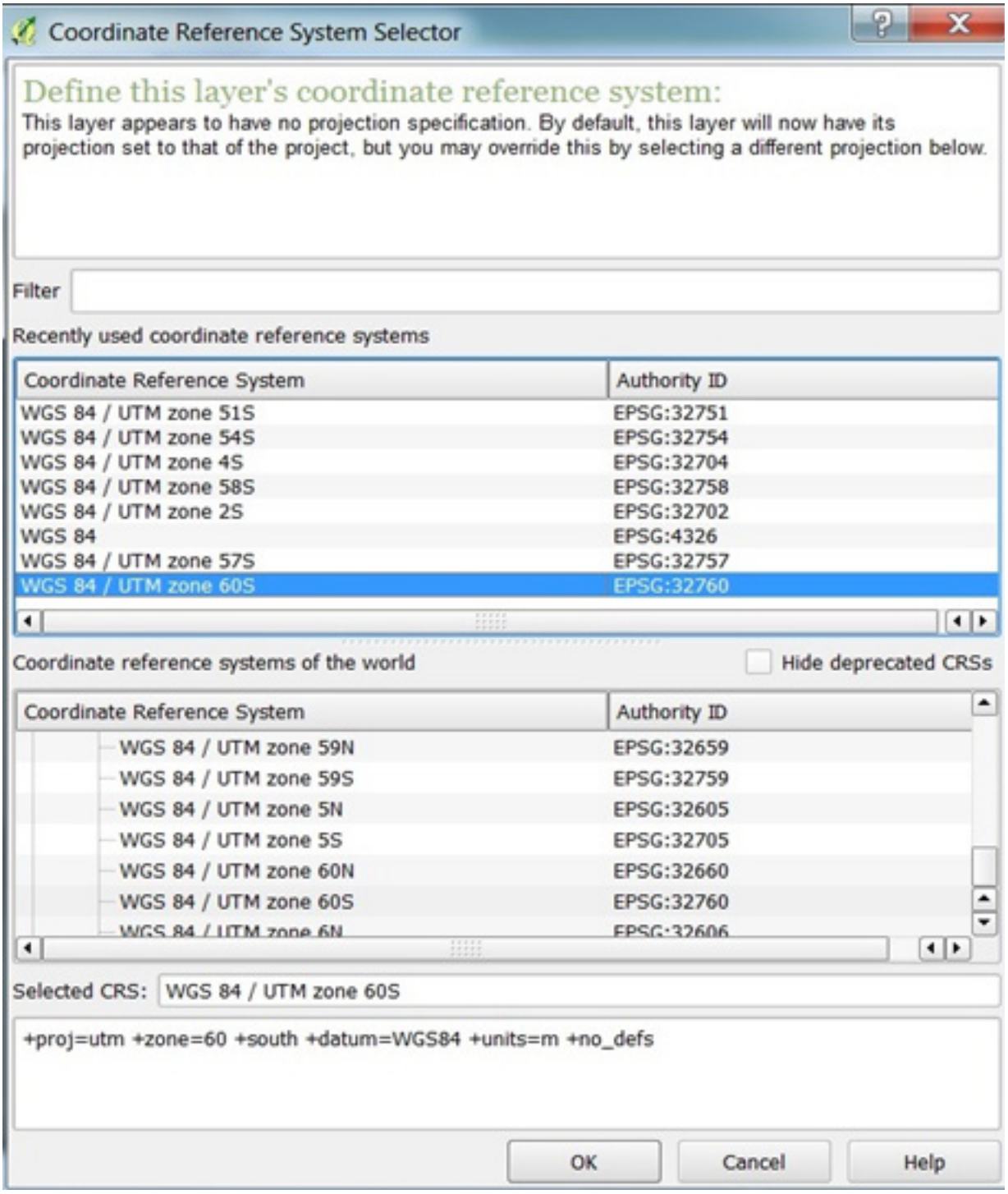
12 b – Name the new layer – **Buildings** **You are going to create a new shapefile layer for the buildings*.

12 c – Select polygon.



**In Chapter 8 you learned about Projected Coordinate Sytem and UTM. Here you are selecting zone 60 S, as Fiji (including Nukulau Island) is located on zone 60 and is South of the Equator.*

12 d – Click on **Specify CRS** and the **Coordinate Reference System Selector** window will appear. Select **WGS/UTM** zone **60 S** and click **OK**.



12 e – Click on the box next to Create and autoincremented key. **This will create a numerical id for each row in the attribute table*.

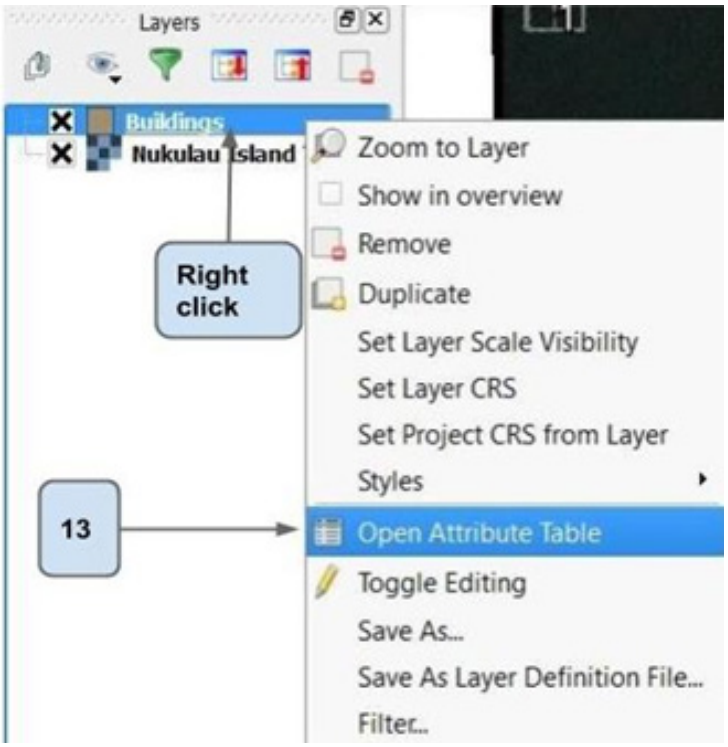
**You will need to add a new attribute. This means that you will create a field so that you can add some information about the buildings. You may not understand this now, but you will learn why you have to create this later.*

12 f – Type in **Type** (as you will want to add information on the type of building) and select Text data (meaning the information you will add about the type of buildings will be in text and not numbers).

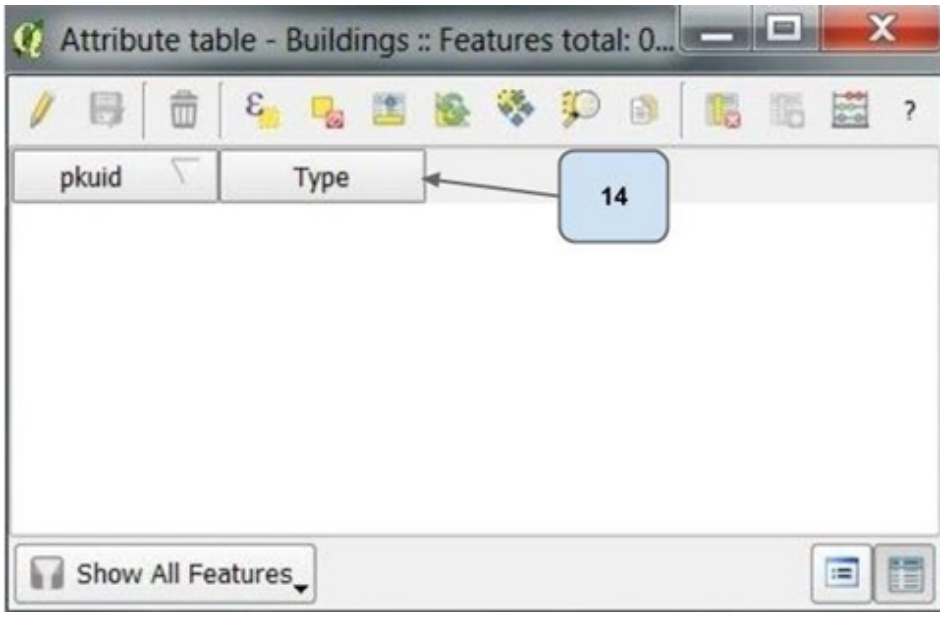
12 g – Click on **Add attribute to list** and you will see your new attribute will show in the Attribute list.

12 e – Click OK.

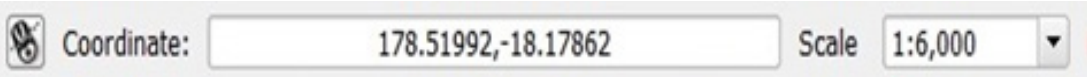
Step 13 – In the Layers window you will notice the new **Buildings** shapefile created. Right click on the Buildings layer and select **Open Attribute Table** to view the fields that you have just created.



Step 14 – In the Attribute Table window, you will notice the field you created earlier on (**Type**). Right now there is no data or information here and that is because you have not entered or added any.



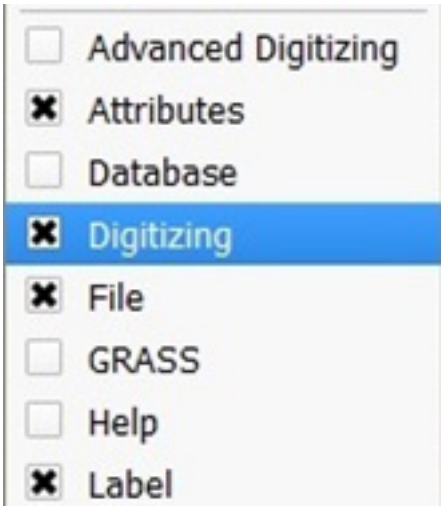
Step 15 – Before we actually start creating the shapefiles, let's change the map scale. In the Status bar at the bottom of your screen, change the scale to **1:6000** by typing it in and press enter. Now type in **1:1000** and press enter. Notice how the image moves in and out? At different scales of your map you can see features in your map either with more details or with fewer details.



You can experiment with the scale later. For the purpose of this exercise, change the scale to **1:2000**. This means that 1 unit (it can be cm, mm, m or km) on the image is equal to 2000 of that unit in real life. **When digitizing buildings and roads, 1:2000 is used as it is the minimum mapping unit (MMU)*.

Step 16 – Now we are going to create some shapefiles to represent the buildings and we will use the raster image of Nukulau as our base map. Click on the **Buildings** layer to highlight it and click on the **Toggle Editing** tool.

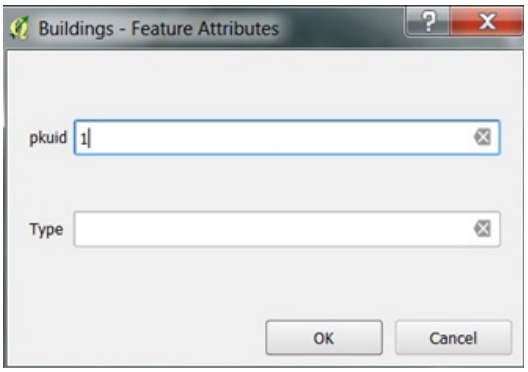
If you do not see the **Editor tool, right click on any empty space and check **Digitizing** to activate it.*



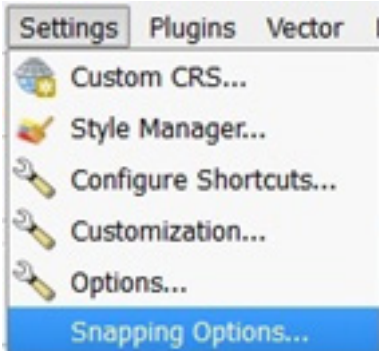
Step 17 – Click on **Toggle editing** tool and then the **Add Feature** tool. **You will notice your pointer will change into a small circle. You are now ready to create you first polygon*.

Step 18 – Click on the corner of one of the buildings in the image creating a point, then click on another corner of the building to create a line. Do the same to all four corners, noticing the red polygon. Once you have reached the final corner, double click to end.

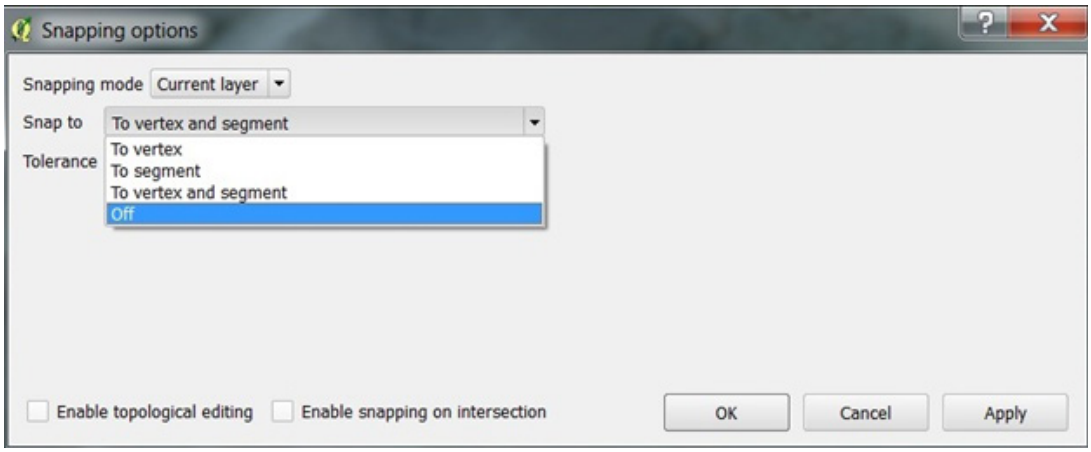
Step 19 – The Features Attributes window will appear where you can fill in some information. Next to **pkuid** (ID) type in 1. Leave the box next to **Type** blank as we do not know what type of building this is, whether it is a church, household or school. Click **OK**.



Step 20 – Go to Settings and select **Snapping Options**.



Step 21 – Click on the drop down arrow next to **Snap to** and select **Off** . Click **Apply** and then **OK**. **If you do not do this, when you try to create the other polygons, it will create it on top of the first polygon you created. Meaning it will snap the second polygon on top of the first polygon*.



Step 22 – Create the rest of the polygons with a different id number. Since the first polygon has id number 1, the other two can be given id number 2 and 3. You should have three buildings altogether.

If your polygons are not in a perfect shape, you can always edit it using the **Node tool*.

Step 23 – To edit polygons, click on the **Node Tool**. This tool allows you to move the corners of the polygon so that it forms a nice square or rectangle.

Step 24 – Notice the small red crosses that marks the corners of the buildings layer. Click on the corner that you want to edit and move it so that it makes a perfect square or rectangle.

Step 25 – Once you are satisfied with your buildings layer, click on **save edits** and then click on the **Toggle editing** tool to end your edit session.

**Always remember to click on Save edits in order to save everything you do. Everytime you want edit this layer click on Toggle Editing*.

Congratulations

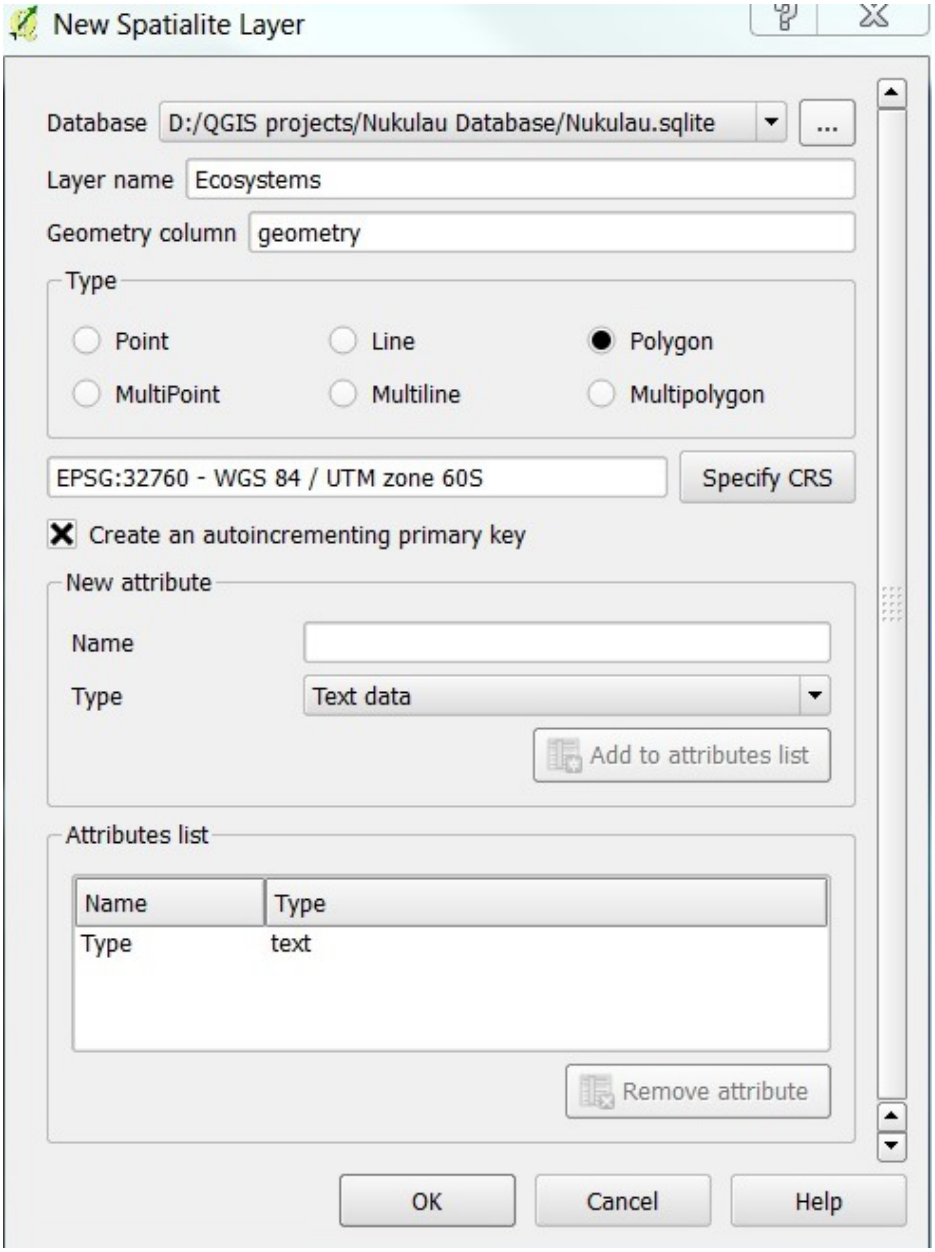
You have successfully created and edited a polygon layer to represent buildings.

We are now going to look at the attribute table.

Step 26 – Click on the Buildings layer and open the attribute table, notice how you have entered the id numbers? If you had information on the buildings you would have information on the Type column but because we have no information let's leave it blank for now.

Now, we are going to create another layer and we will name it ecosystem. Ecosystem can simply be defined as the different communities of living and non-living things. For example, grass land, forest, beach, reef, mangroves, river or deep to name a few.

Step 27 – Create a new SpatiaLite layer and name it Ecosystems. Select Polygon, check the box next to Create an autoincrementing primary key and specify the CRS to WGS / UTM zone 60 S then click OK.

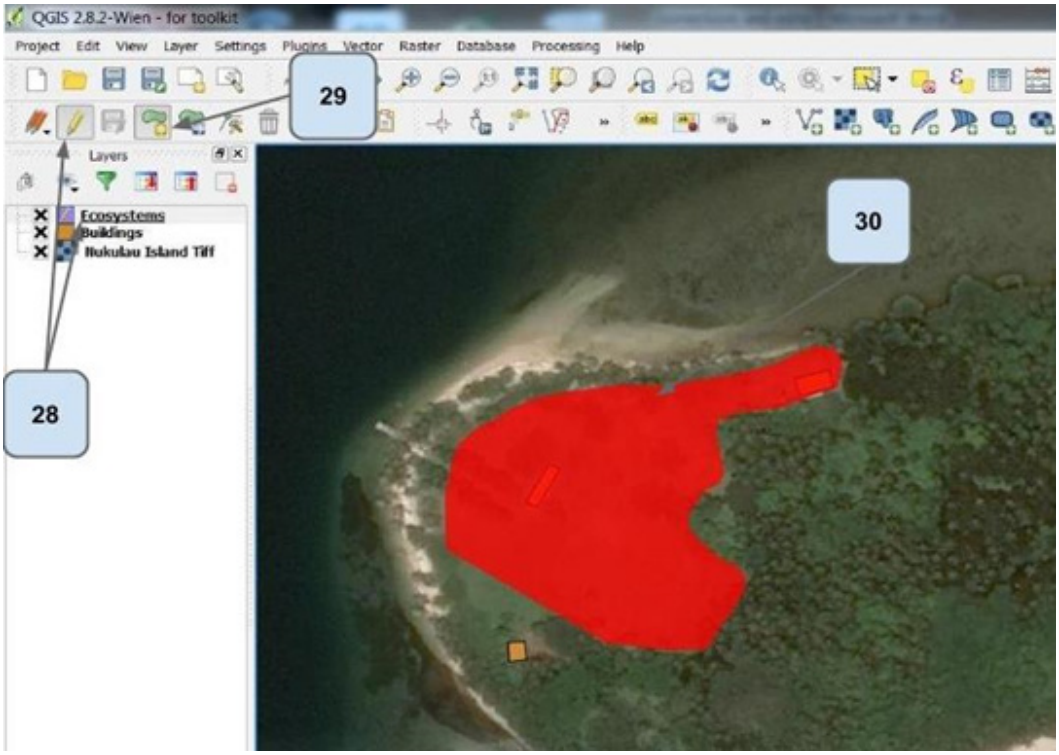


Step 28 – Click on the new Ecosystem layer to highlight it and then click on the **Toggle editing tool**.

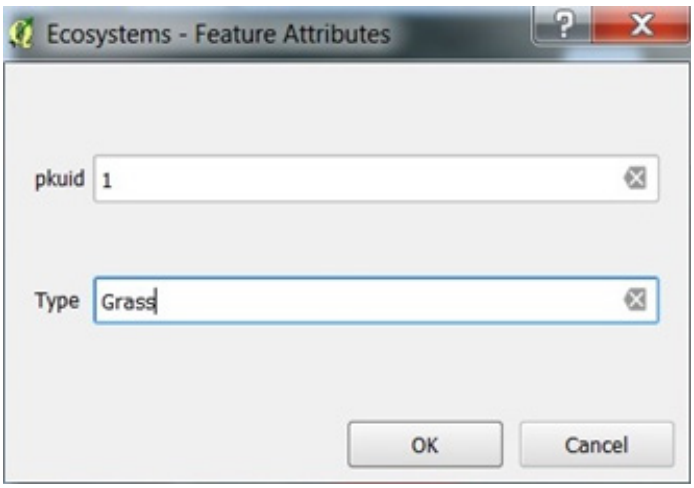
Step 29 – Click on **Add Feature** and create the following Ecosystems from the image:

- Grass, Forest, Beach, Reef and Sea.

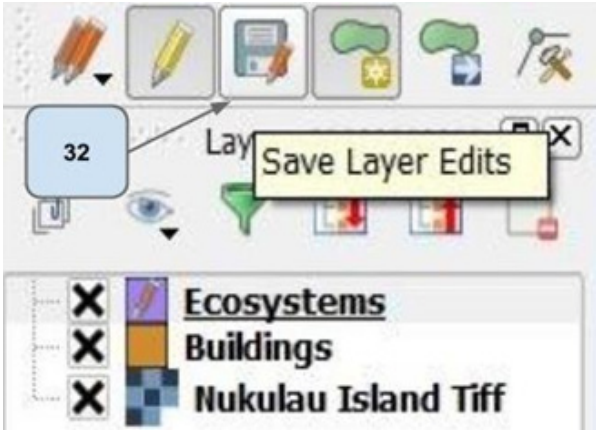
Step 30 – Start with the Grass ecosystem first. Click around the boundary of the grass area so that the corners curve instead of having sharp edges. Right click to finish.



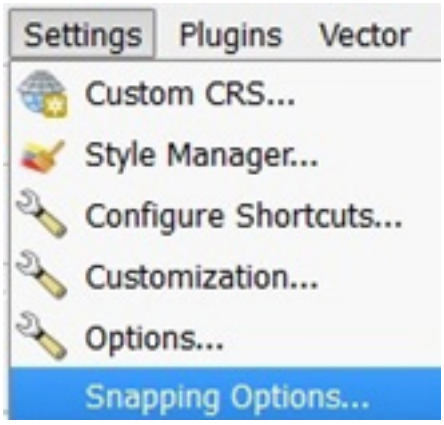
Step 31 – Enter id number and type in **Grass**.



Step 32 – Click **Save Edits**. **Always remember to click on Save Edits so that all the changes you make are saved*.

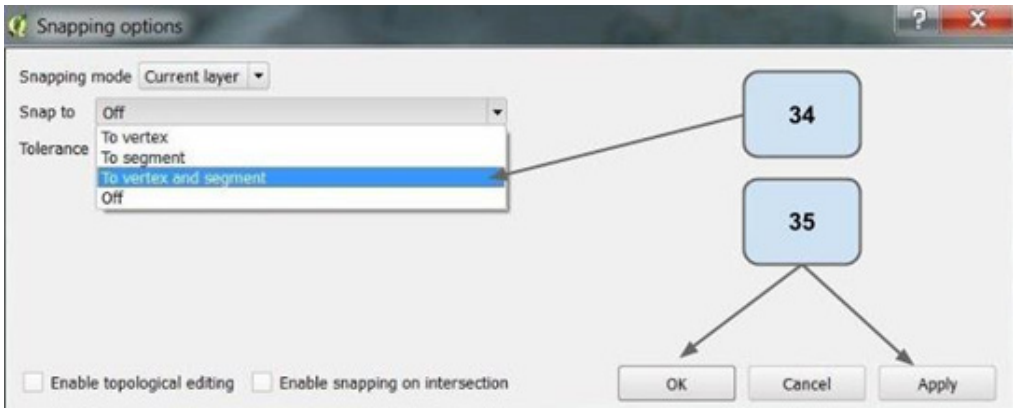


Step 33 – Before you create the Forest ecosystem. Go to **Settings** and click on **Snapping options**.



Step 34 – Select snap to: **vertex** and **segment**. **This will allow you to create another polygon right next to the first one making sure that the boundaries do not leave any space or gaps in between*.

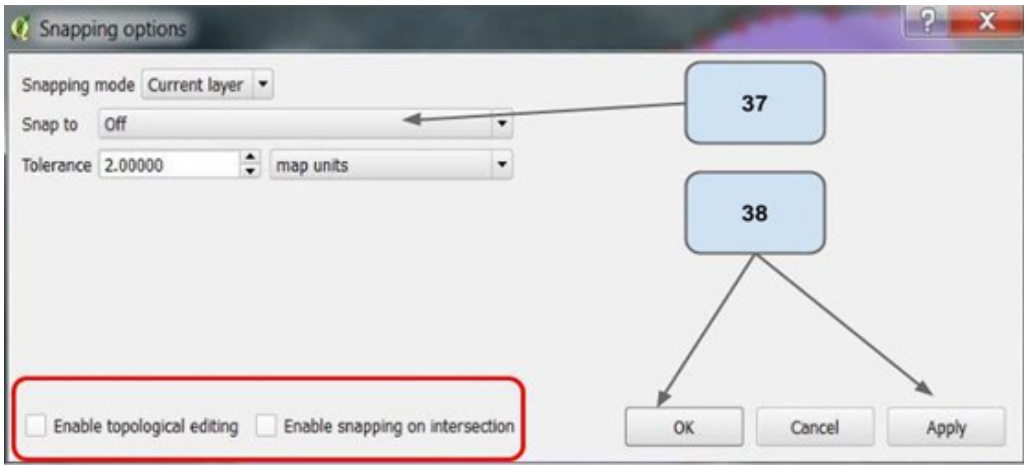
Step 35 – Click **Apply** and **OK**.



Step 36 – Start creating the Forest ecosystem by clicking on the boundary of the Grass area that you had just created. You will notice a pink cross that will snap the two boundaries, continue to click as you go along the boundary.

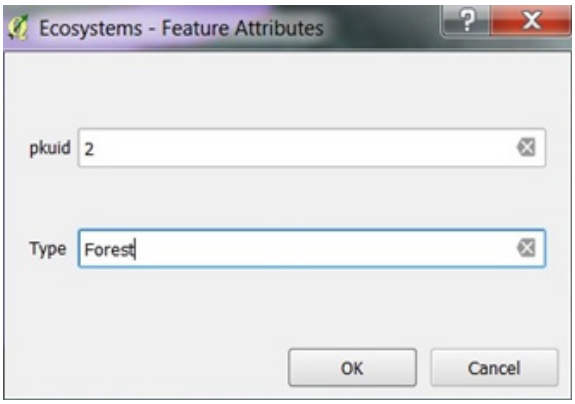
Step 37 – Once you reach the end of the boundary of the Grass ecosystem, you need to turn of the snapping setting, because you want to create the rest of the polygon without snapping it back to the first polygon. Go to **Settings > Snapping options**… and turn off snap.

Step 38 – Click **Apply** and **OK**.



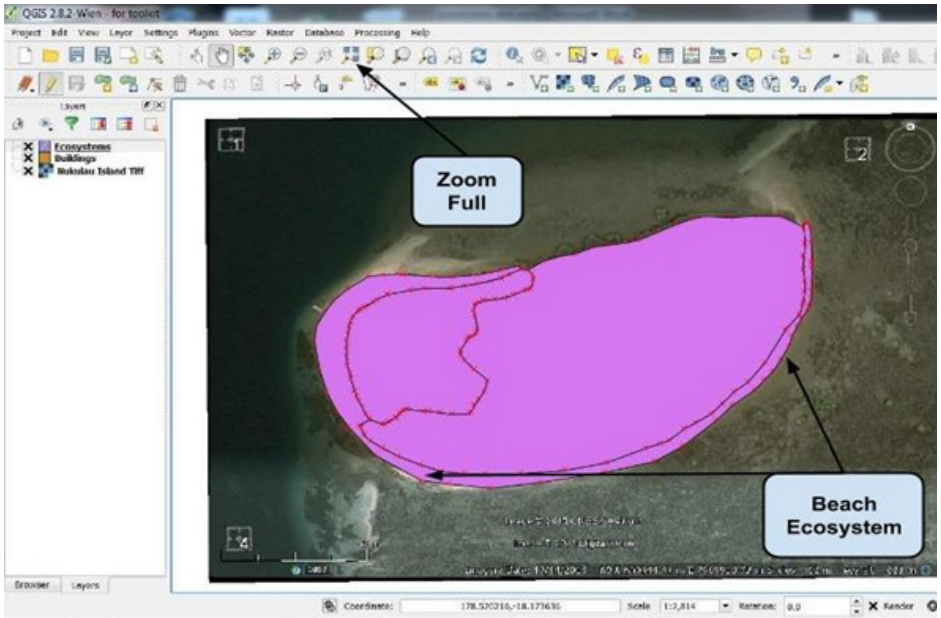
Step 39 – Continue to create the polygon for the Forest ecosystem. Right click to finish.

Step 40 – Enter information in the Feature Attributes window. And then click **Save Edits**.

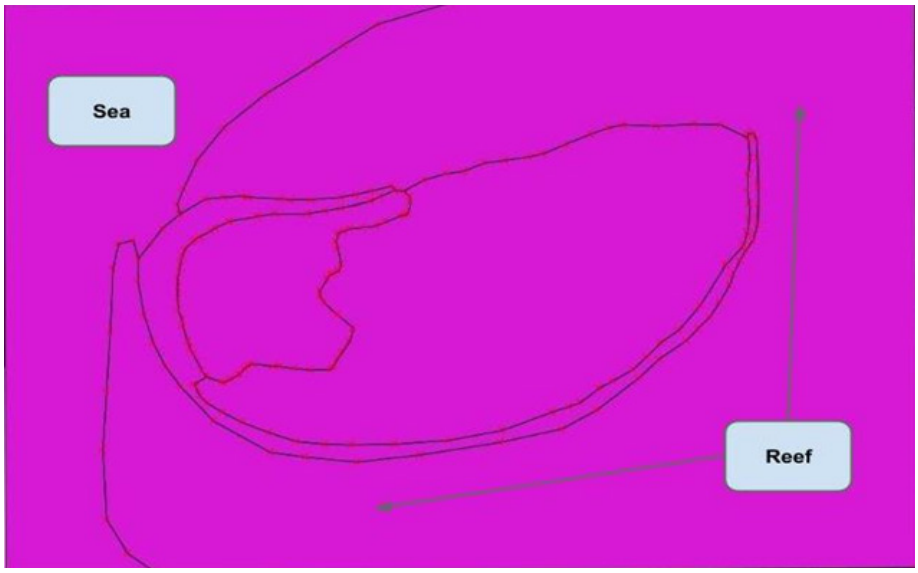


Step 41 – If you zoom in closer to the boundaries of the two polygons you have created you will notice that there are no gaps. This is because of the Snapping options that you had used earlier on. See example below.

Step 42 – Continue to create the polygons for the **beach, reef and sea** following the same methods you did for the first two polygons. After you finish creating the polygon for the beach ecosystem, click on the **zoom full** tool before creating the last two polygons.



Step 43 – Create the Reef and Sea ecosystems.

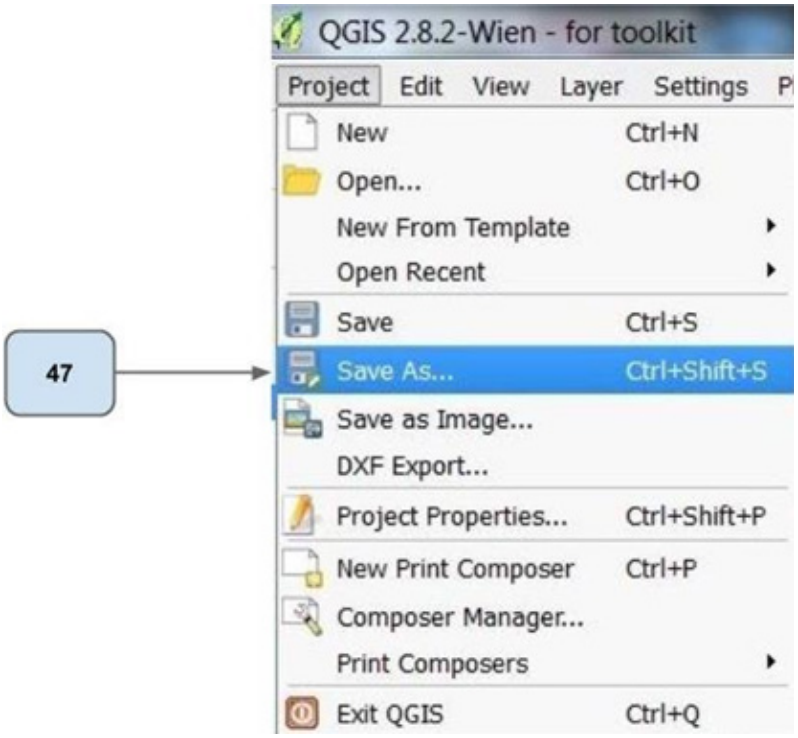


Step 44 – Once you finish creating the last two ecosystems, click **Save edits** (*to save the changes you made*) and the **Toggle Editing tool** to end the editing session.

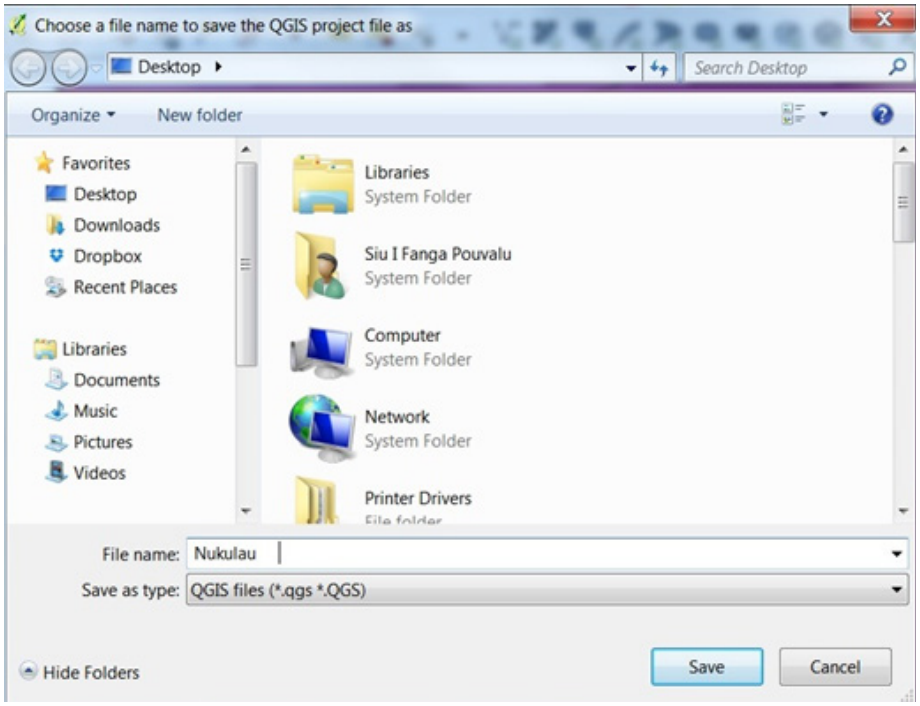
Step 45 – Right click on the **Ecosystems** layer and select **Open Attribute Table**. You have just created one polygon layer named **Ecosystem** and have created 5 different polygons with different attributes or information. In this case the attributes are the names of the ecosystem i.e. grass, reef, sea, forest and beach.

Step 46 – Close the attribute table.

Step 47 – Go to Project and select **Save As**… **This will allow you to save this map project and you can work on it later*.



Step 48 – A new window will appear, name your new project **Nukulau** and click save. Make sure you know where you saved this map project, in this example it is saved on the Desktop for easy access (you can choose or create a folder to save your map projects in).



Congratulations

You have just created multiple polygons and entered information (attributes) for each one. Next you will create different symbols for each attribute.

Now that you have saved your map project, you can either continue to the next section or close QGIS and continue with the next section another time.

11.3 – Symbolizing

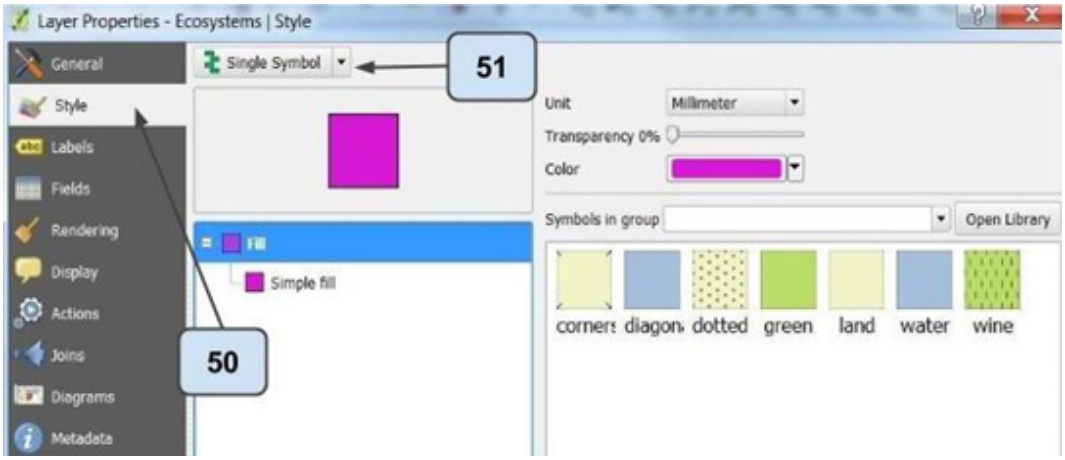
In the last section you created polygons and added some information about each polygon. In this section you will symbolize each polygon so that they are all different.

If you had closed your map project, open your map project. Start **QGIS, go to **Project > Open** and select your map project from where you saved it*.

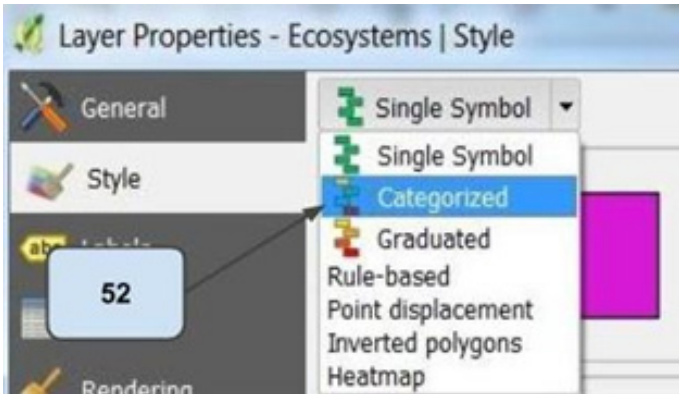
Step 49 – We are going to symbolize the different ecosystems. Right click on the Ecosystems layer and select **Properties**.

Step 50 – Click on the **Style** tab.

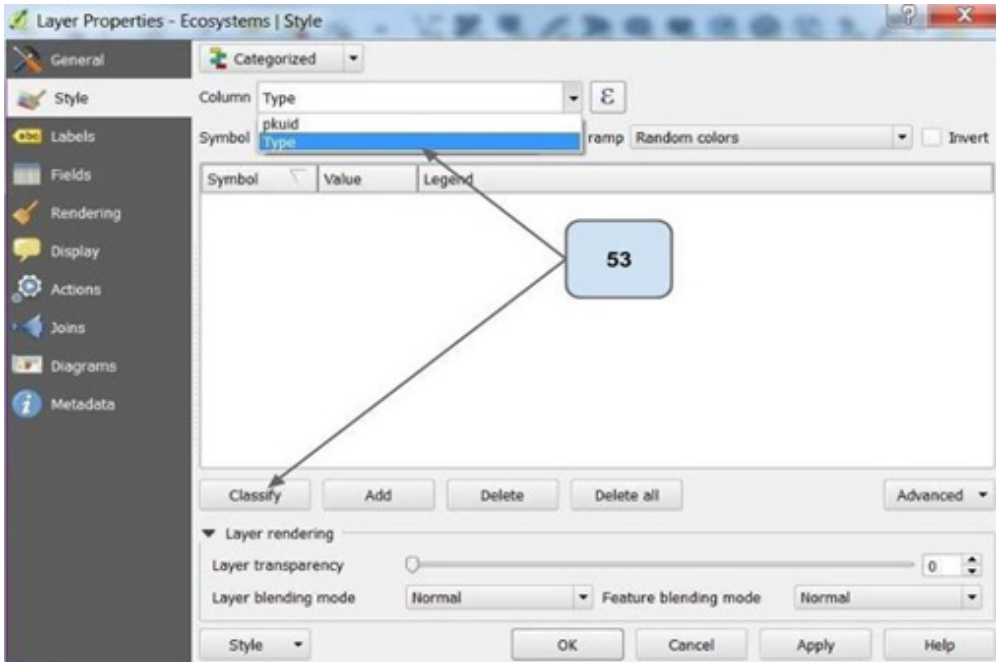
Step 51 – Right now this layer has only one symbol, meaning all the polygons are represented by a single color. In the example on the next page it is symbolized by the color purple.



Step 52 – Click on the drop down arrow next to **Single symbol**. In this list are different ways to symbolize your data. From the list click **Categorized**, so we can categorize the different ecosystems.

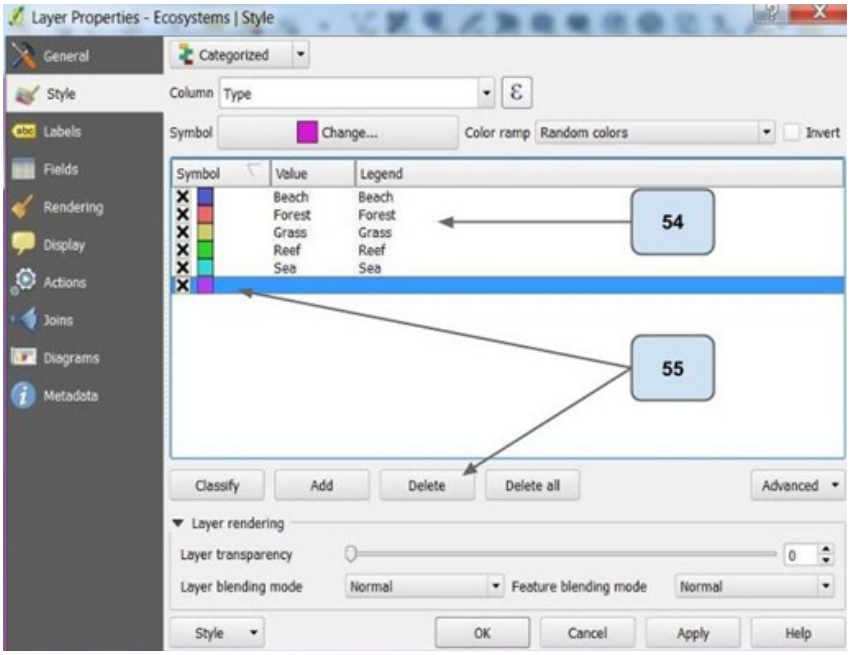


Step 53 – Next to **symbol**, click on the drop down list. This will show you the fields from the table of attributes that you will choose to symbolize the layer with. Because this is an ecosystem layer, we want to symbolize using the different types of ecosystem, so we are going to select **Type. Click Type** and then **Classify**.



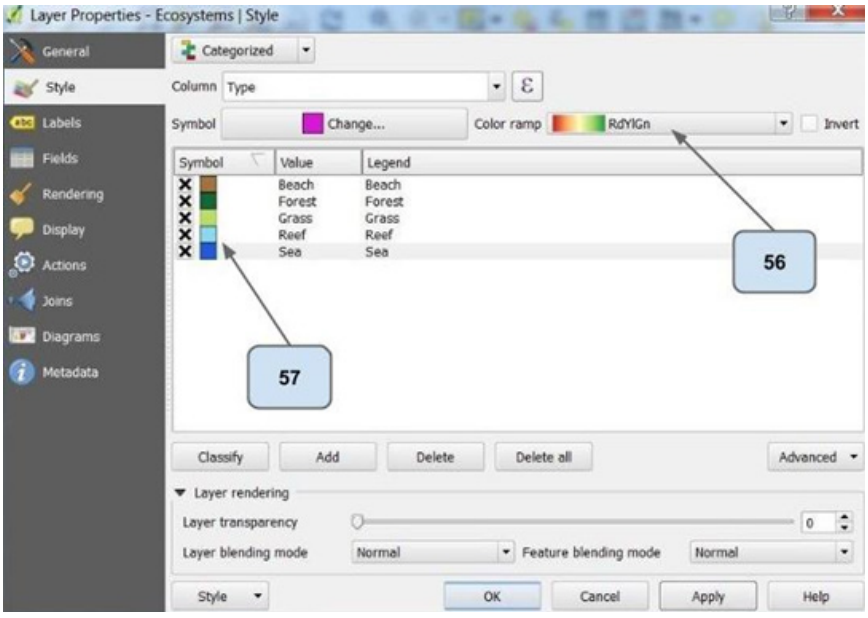
Step 54 – You should now be looking at the different types of ecosystems being symbolized with different colors. Pretty cool huh?

Step 55 – Select the color with no attribute right at the bottom of the list and select delete to remove it from the list.



Step 56 – Right now, the colors are set randomly, however you can choose your own colors by clicking on the Color ramp.

Step 57 – You can also change the colors by clicking the color symbols. This will allow you to give appropriate colors for each ecosystem. For example **dark blue** to represent sea, **light blue** – reef, light brown for beach, **light green** for grass and **dark green** for forest.



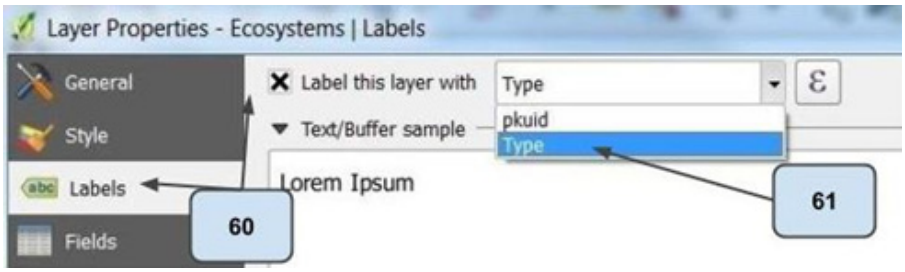
On your map, the different ecosystems should now be symbolized with different colors.

Step 58 – The next thing we are going to do is label your map. Right click on the **Ecosystems** layer and select **Open Attribute Table**. Which Field do you think is the best one to label the map with? The field with the names of the different ecosystems is the best one (**Type**). Close the attribute table.

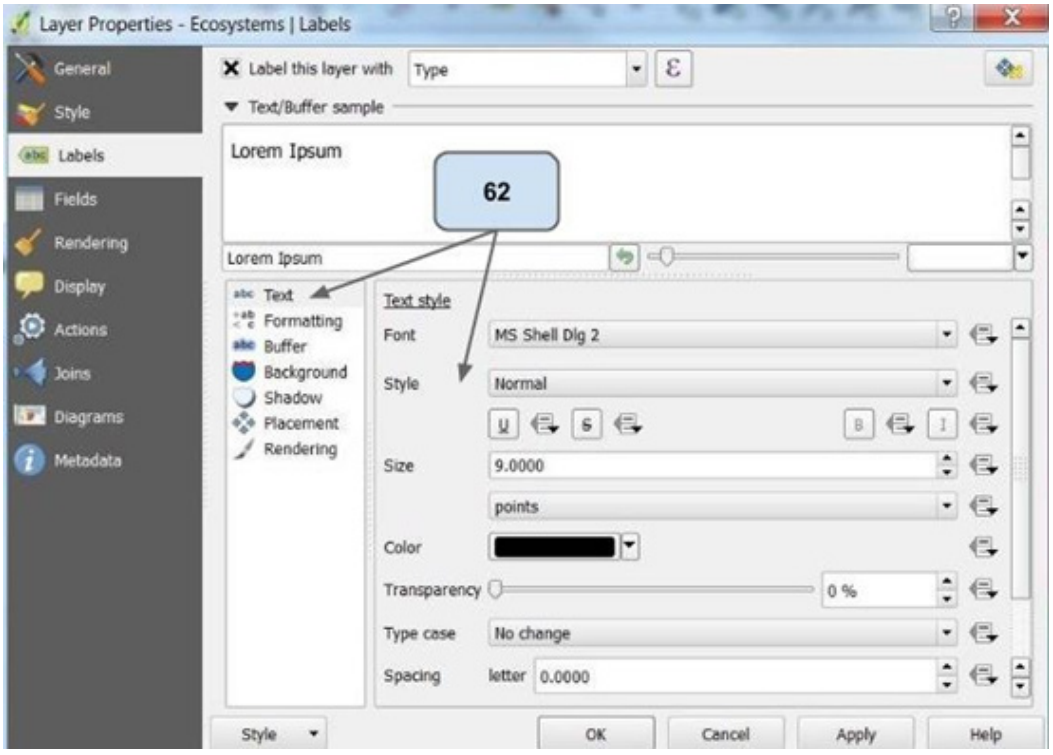
Step 59 – Open the **Properties** window. Right click on the **Ecosystem** layer and open the Properties window.

Step 60 – Click on the **Labels** tab and check the box next to **Label this layer with**.

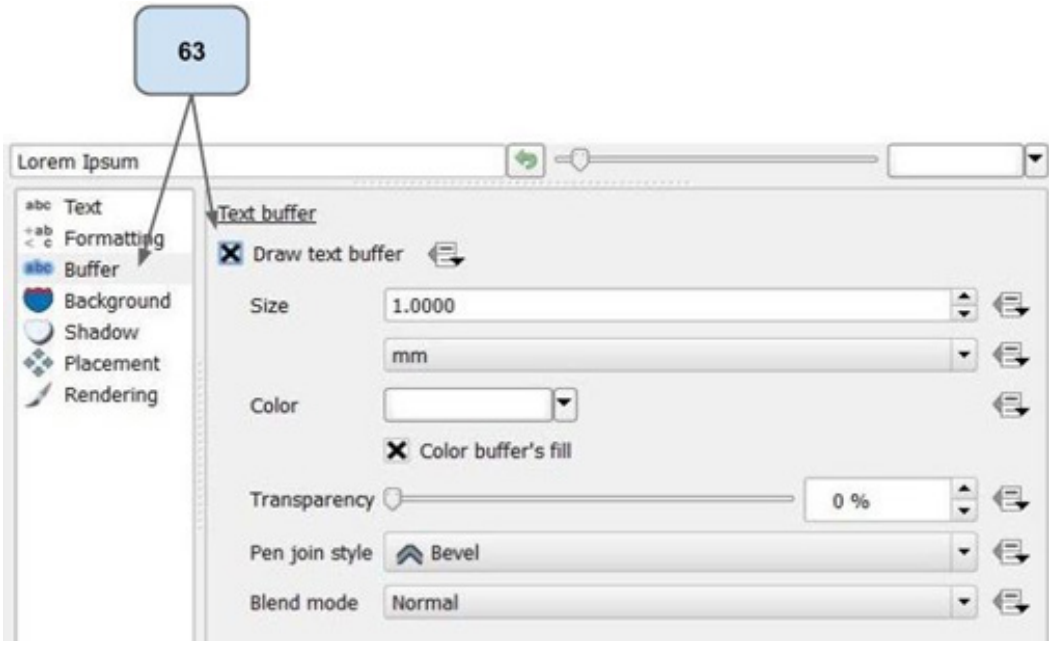
Step 61 – From the drop down list, select **Type**.



Step 62 – Click on **Text**. In this section you can select different font, style, size and colour for the labels. You can leave everything as it is.

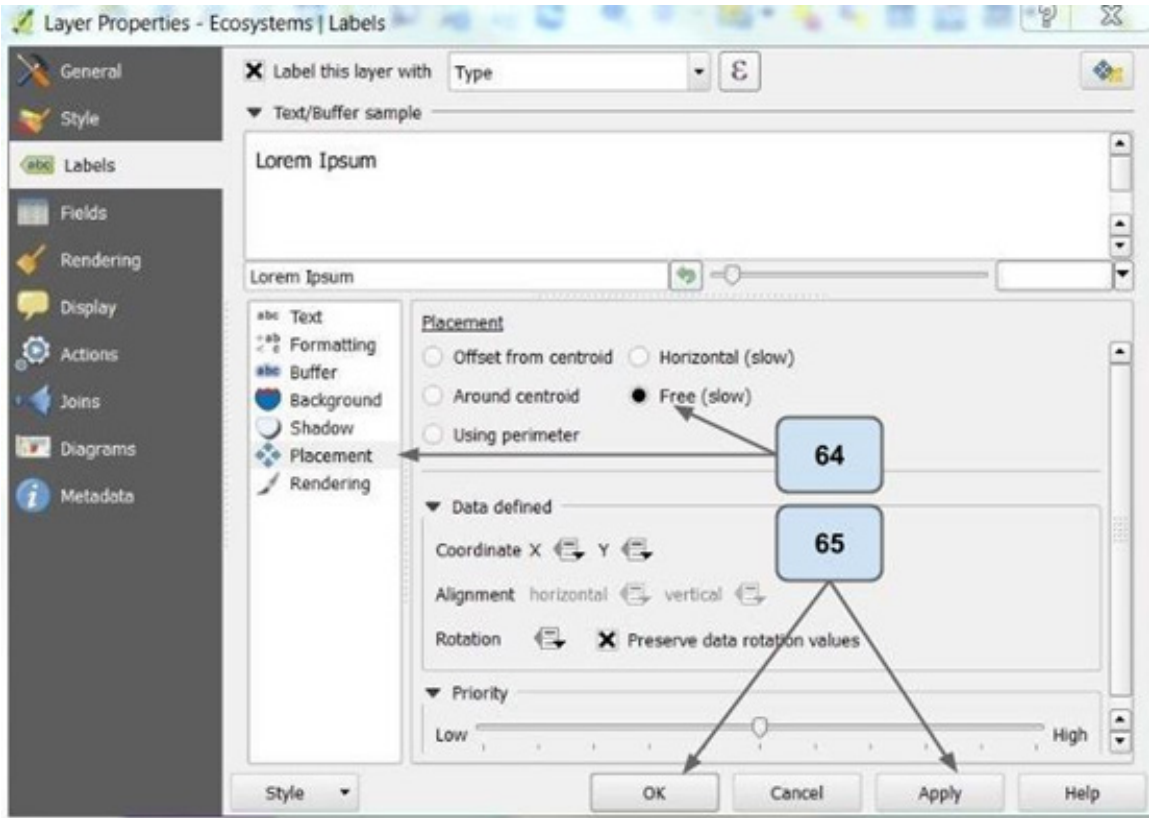


Step 63 – Click on **Buffer** and check the box next to **Draw text buffer**. This will create a white border around the labels.



Step 64 – Click on **Placement**, this setting will select where on the polygon the label will be placed. Select **Free (slow.)**

Step 65 – Click **Apply** and **OK**.



Step 66 – Your map should look similar to the image below, but you may use different colors.

Notice how you cannot see the **Buildings and Nukulau** image?? Do you know why??

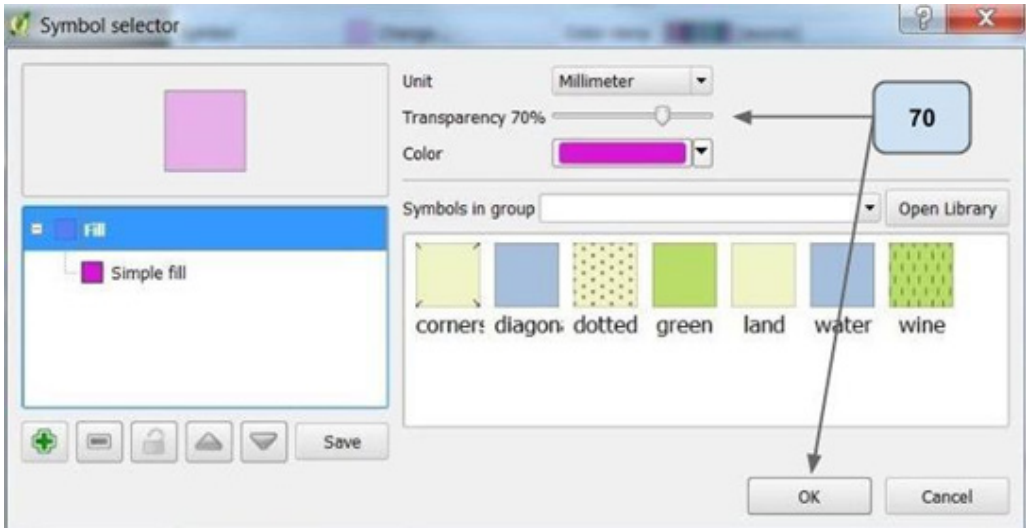
**Always remember that everything in your map is in a layer. If you have one large polygon like the Ecosystems layer on top of a smaller one like the buildings you will not be able to see the Buildings layer. You will have to order the features so that the small polygons are on top of the large ones.*

Step 67 – Click on the **Ecosystems** layer and drag it beneath the **Buildings** layer.

Step 68 – Right click on the **Ecosystems** layer and select **Properties**.

Step 69 – Click on Style and click on **Change**... change the transparency of the layer so that you can see the image.

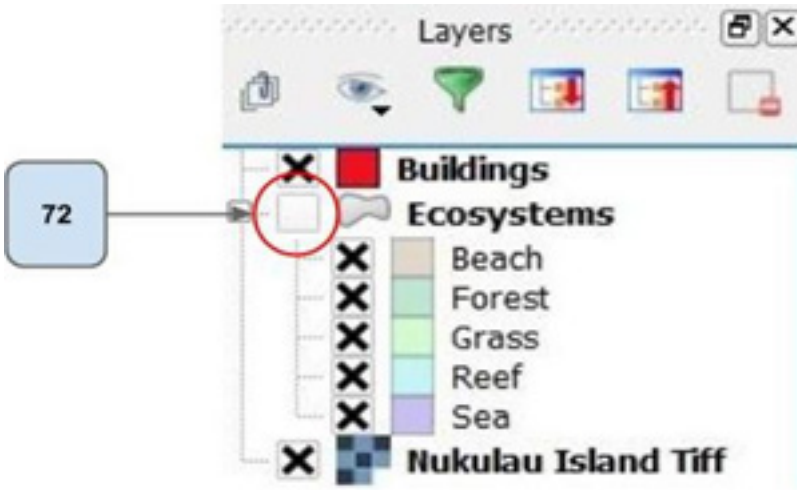
Step 70 – Change the **Transparency** to 70% by dragging the dial across until it reaches 70%. And then click **OK**.



Step 71 – You should now be able to clearly see all the different ecosystems on and around Nukulau Island.

11.4 – Creating a point shapefile

Step 72 – Now we are going to create a point shapefile to represent the coconut palms. In the Layers window uncheck the boxes next to Ecosystems so you can see the image clearly.



Step 73 – Go to **Layer** and select **Create Layer** > **New Spatialite Layer**.

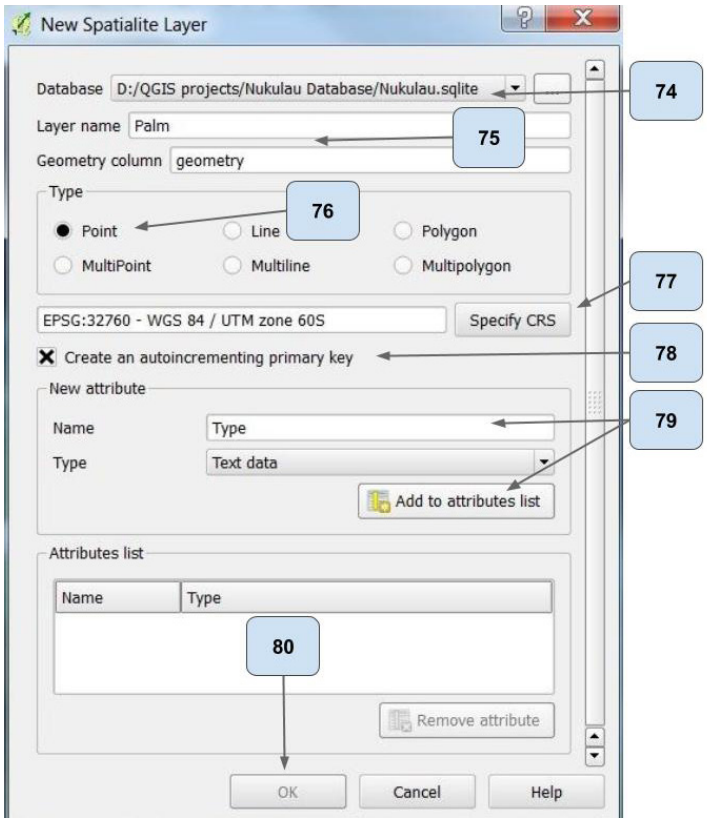
Step 74 – Once the New Spatialite layer appears, make sure you are saving this new shapefile in the **Nukulau database** that you created.

Step 75 – Name the layer **Palms**.

Step 76 – Now select **Multipoint**. You are selecting multipoint because you will create more than one point to represent all the palms.

Step 77 – Click on Specify CRS so specify the CRS to WGS 84/ UTM zone 60 S.

Step 78 – Check the box next to Create an autoincrementing primary key. This will create a column in the attribute table consisting of numerical ID. (See next page)



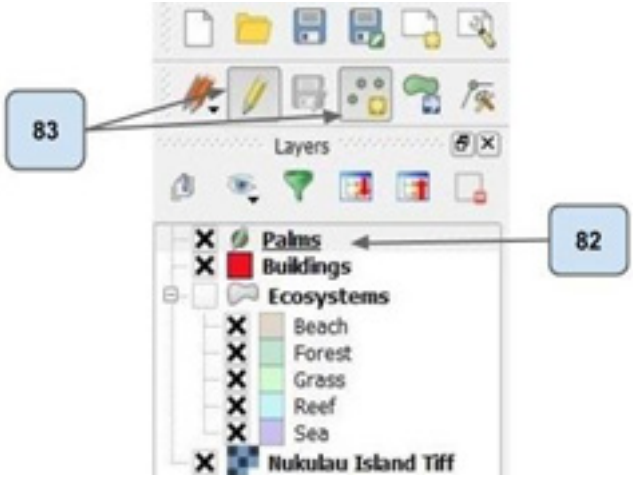
Step 79 – Name the attribute as **Type** and click **Add to attributes list**.

Step 80 – Click **OK**.

Step 81 – Make sure your scale is still set to 1:2000

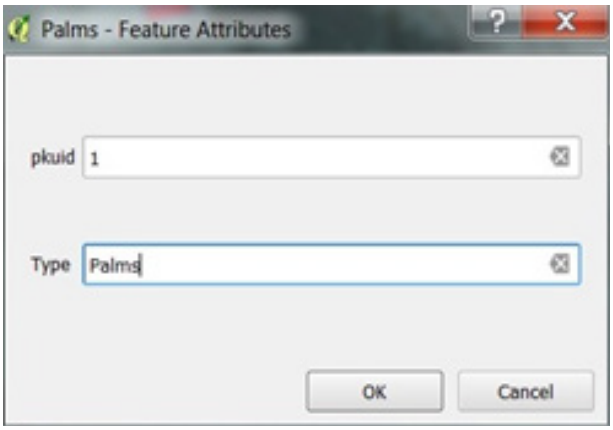
Step 82 – In the Layers window, click on the new **Palms** shapefile that you have just created to highlight it.

Step 83 – Click on the **Toggle Editing** tool and then click on the **Add Feature** tool.

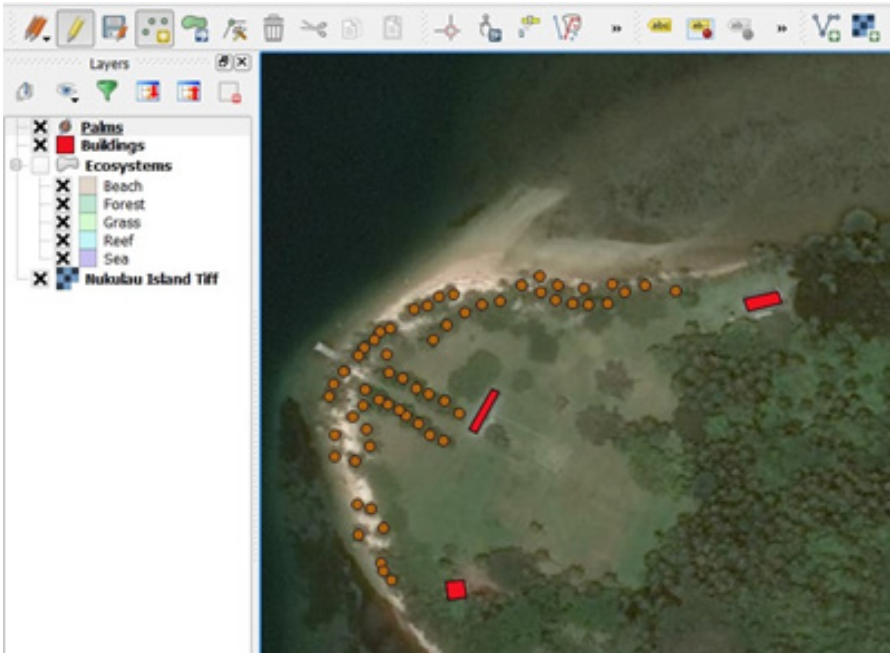


Step 84 – On the western side of the island near the beach area, you can see small patches of palm trees. Place points on the trees by clicking on it.

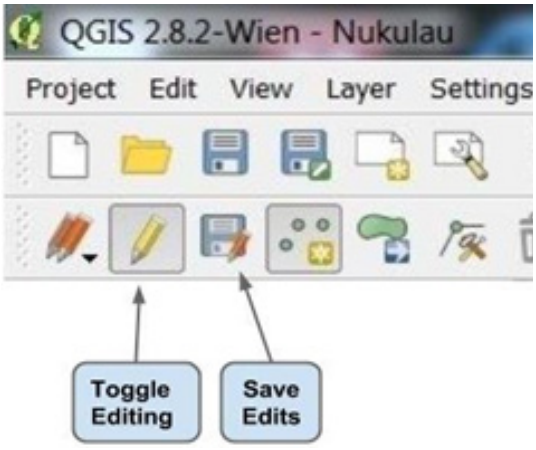
Step 85 – Once you click to add a point, the Feature Attributes window will appear. Fill in the tabs and give every point an id number starting from 1.



Here is an example of the new Palms shapefile. You can change the **size to 1.00000** and color to **green**.



Step 86 – Click on **Save Edits** and then the **Toggle Editing** tool to end the session.



11.5 – Creating a line shapefile

Step 87 – Now we are going to create a line shapefile to represent a path. A line shapefile can be used to represent roads, rivers, creeks etc. Go to **Layer > Create Layer > New Spatialite Layer**.

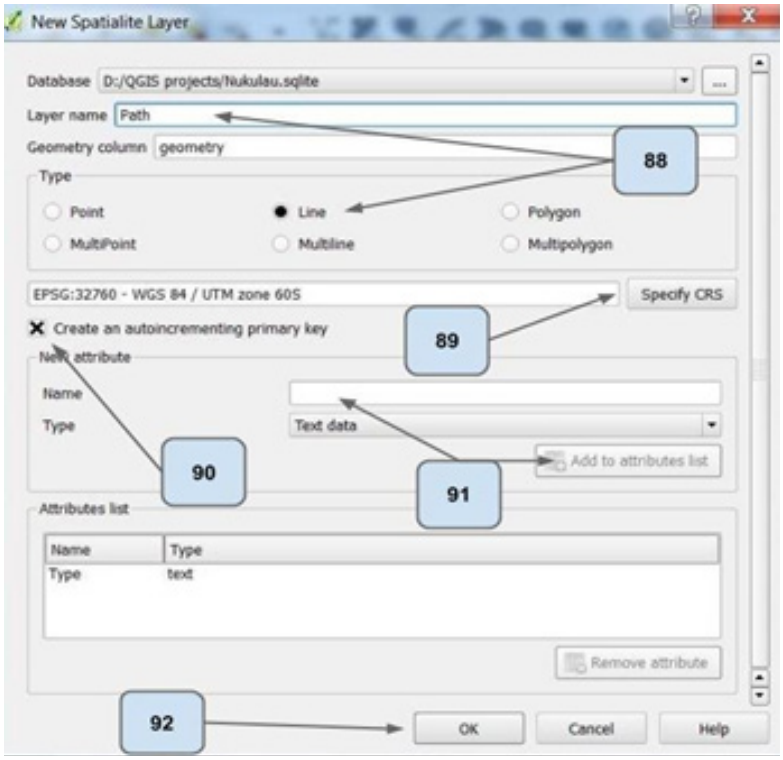
Step 88 – Name the Layer **Path**. For the Type select **Line**.

Step 89 – Specify the CRS to WGS 84 / UTM zone 60 S.

Step 90 – Check the box next to Create an autoincrementing primary key

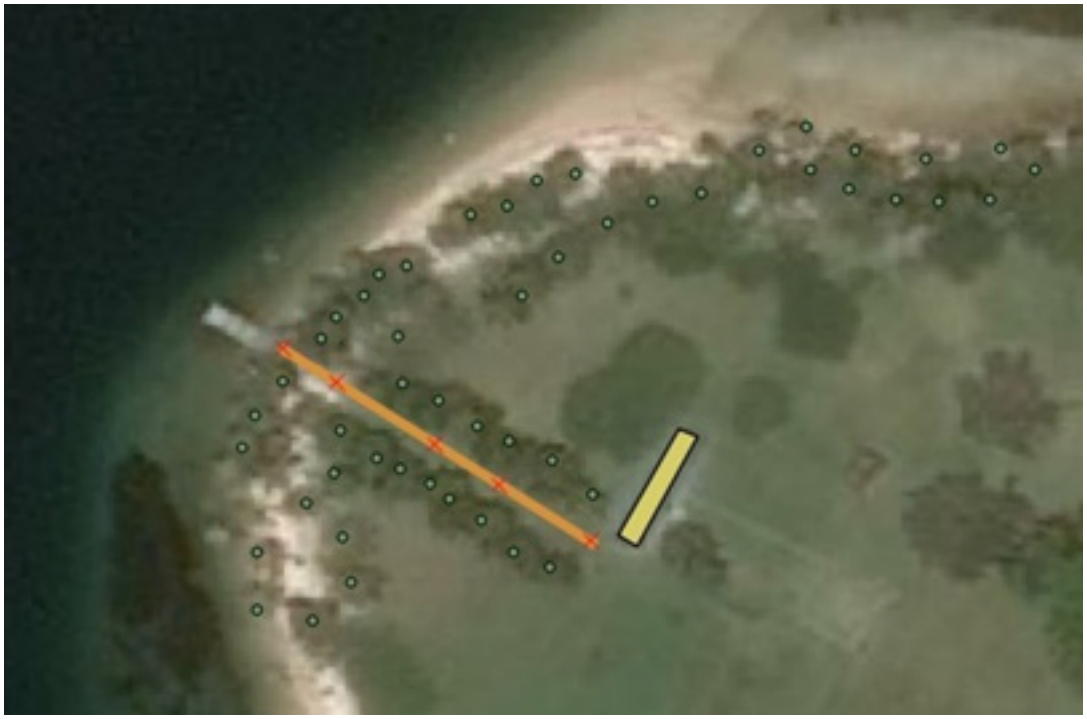
Step 91 – Name attribute **Type** and click **Add to attribute list**.

Step 92 – Select **OK**.

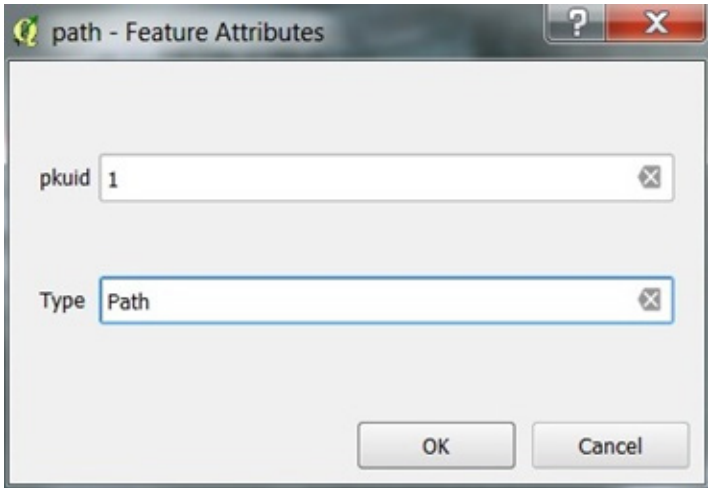


Step 93 – In the Layers window, click on the **Path** layer to highlight it. Then click on **Toggle Editing** and the **Add Feature** tool to add a line feature.

Step 93 a – Add a line to show the path from the building to the beach and change the colour to orange.



Step 93 b – Enter the attributes for this layer and then click **OK**. The image below is provided as an example.



11.6 – Editing a line shapefile

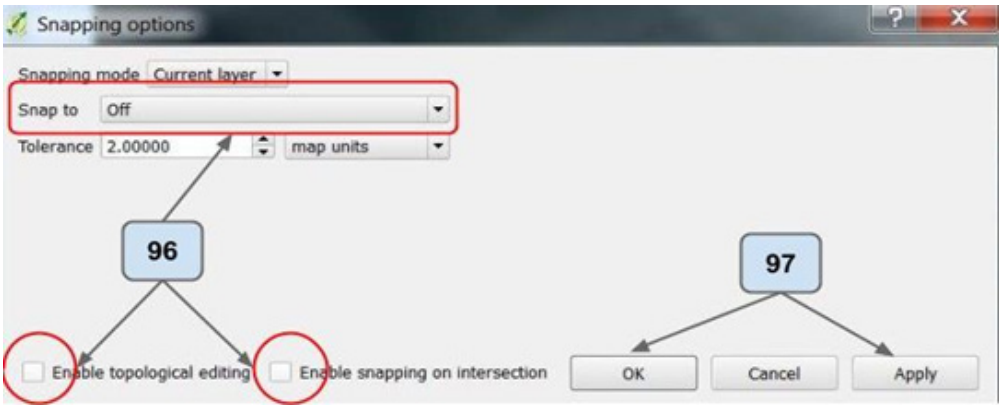
** Only edit features, if they need editing. Note that although you are editing a path layer, you can do the same thing if it is a road, river or any other line features.*

Step 94 – Click on the **Path** layer and then click on the **Toggle Editing**  tool

Step 95 – Go to Settings and select **Snapping Options.**

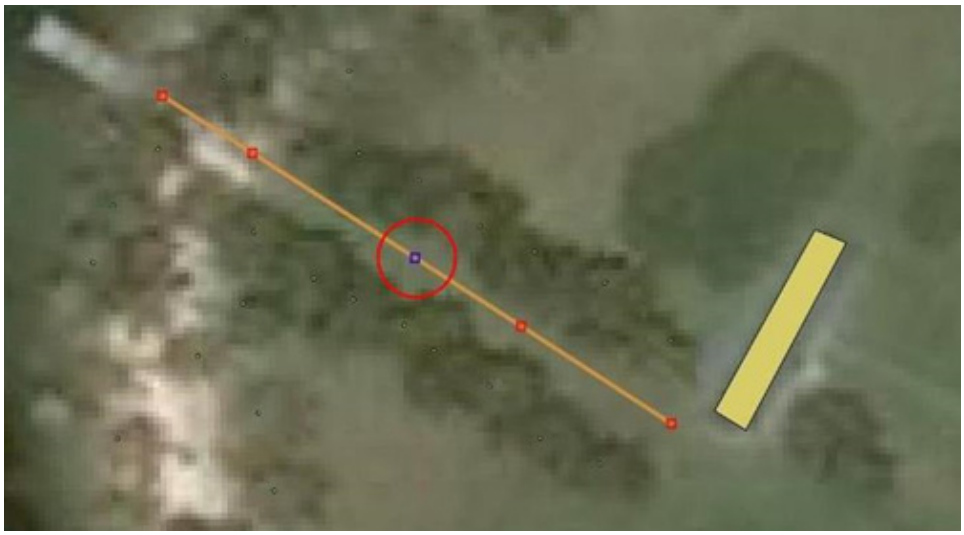
Step 96 – Remove the x in the boxes in the **Snapping options** window.

Step 97 – Click **Apply** and then **OK**.



Step 98 – To move the line around, click on the **Node Tool**  .

Step 99 – Click on the **node or x** that you want to move. Once you click on a node to move, it becomes a blue square.



Step 100 – Once you click on a node, every other node will be highlighted as a small red square.

Step 101 – Click on the node and move it in the direction you want. You will notice that the lines between the nodes appear blue.

Step 102 – Click on **Save edits**.

Go to **Project** and click **Save**.

11.7 – Creating a map - New Print Composer

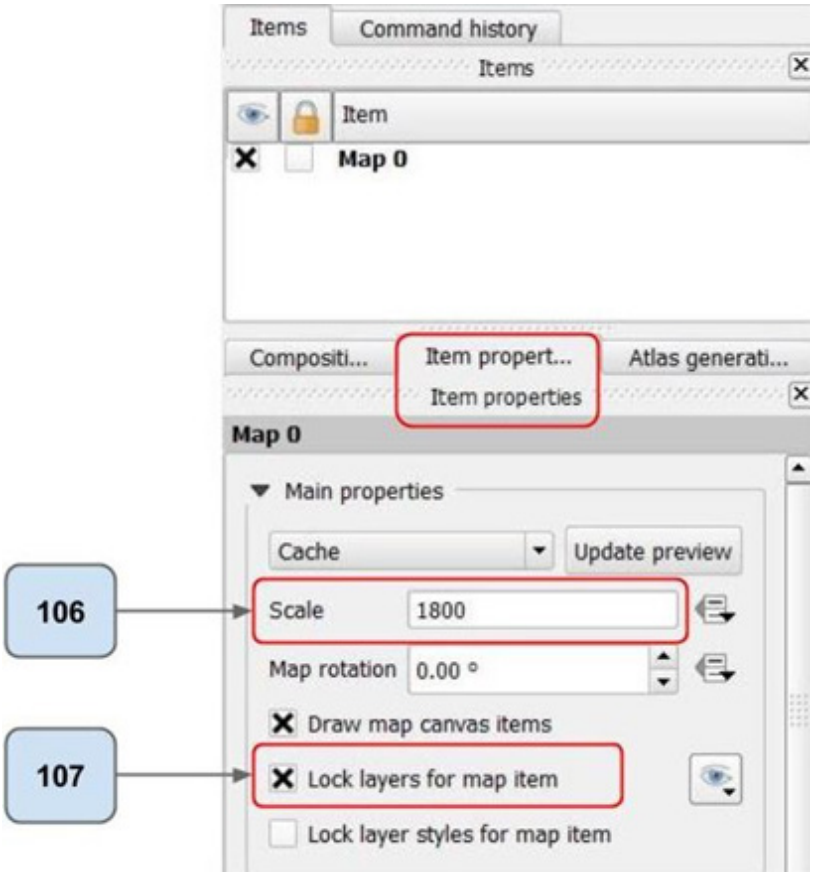
Step 103 – Go to **Project** and select *New Print Composer.*

Step 104 – Type in a title for the print composer e.g. **Nukulau ecosystem map** and click **OK**.

Step 105 – Add your map. Go to **Layout** and select **Add map**. Draw a square in the map canvas to add your map.

Step 106 – Adjust the zoom level for your map so that the entire map fits in perfectly. In the **Item Properties**, change the scale to **1800** and click **Enter** on your keyboard. **If you do not see anything in the Item properties tab, you will need to click on your map to activate it*.

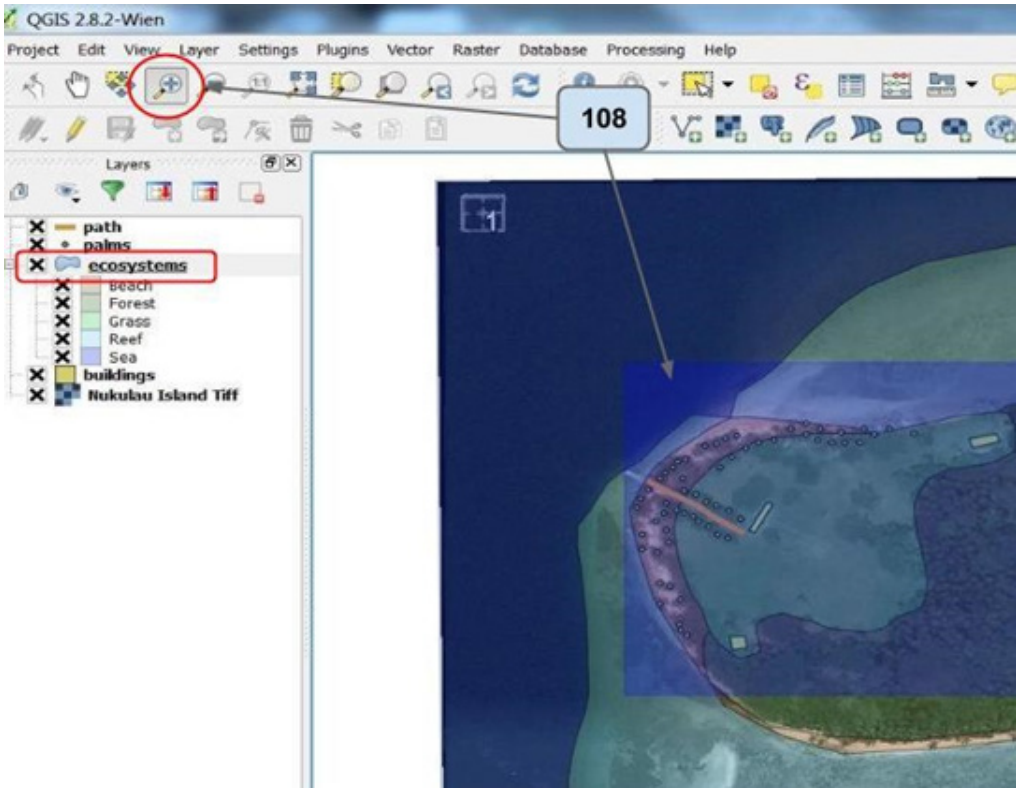
You will notice now that your entire map fits perfectly on your map canvas. You can experiment with the scale and try out other values. Note that 1800 for the scale is NOT the only value you can use, it depends on the size of your map and you may need to adjust this to suit your need if you are working on other data and maps.



Now we will add a map inset that shows a closer view of one of the areas in your map. This is useful if you want to show a closer view of one of the areas in your map.

Step 107 – In the **Item Properties window**, check the boxes next to **Lock layers for map item** and **Lock layer styles for map item**. **This will ensure that you current map view will not change if we make changes*.

Step 108 – Go back to the main QGIS window and check the box next to the **Ecosystems** layer to make the layer visible. Use the zoom in button to zoom to the area around the Grass ecosystem by drawing a square around the area.



Step 109 – You are now ready to add the map inset of the area you have zoomed in to. Go to the Print Composer window. Go to **Layout** and select **Add Map**.

Step 110 – In the bottom left hand corner of your map draw a small square to add your map inset – the area that you zoomed into. **You can place it anywhere on your map but for this exercise we will place it in the bottom left hand corner*.

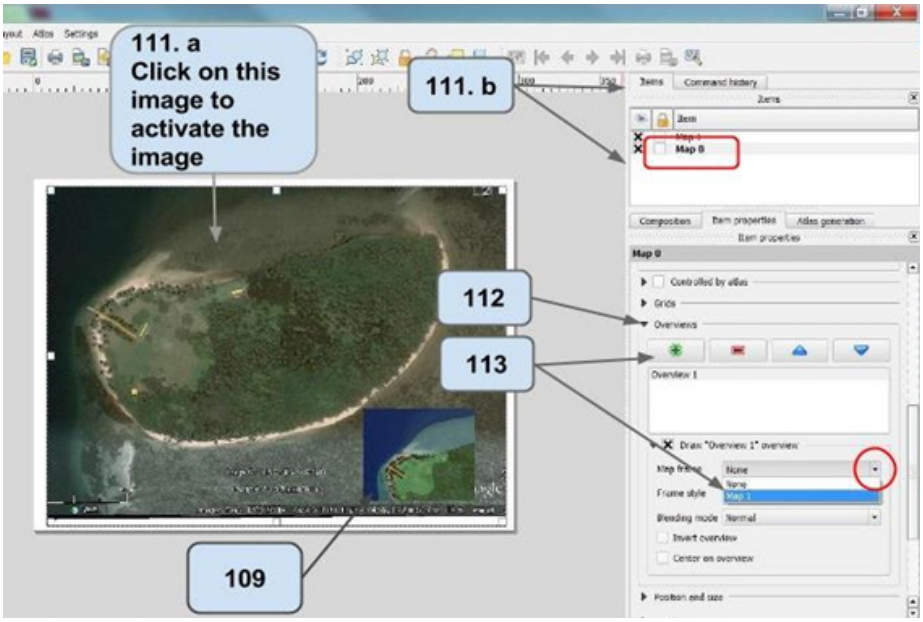
**One of the cool things you can do with QGIS is highlighting the area from your main map (first map you added – Map 0) to show the area of your map inset*.

Step 111 a – On your map view click on the image of the first map you added to activate it.

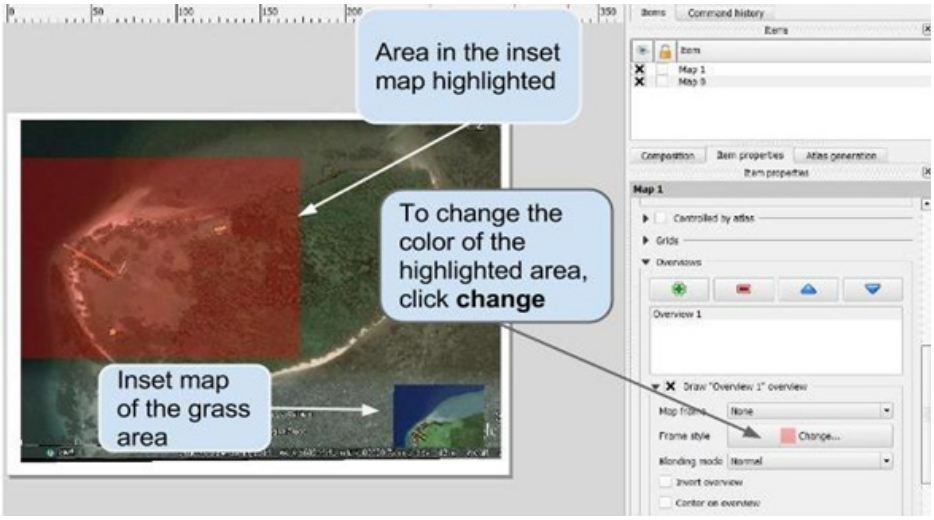
Step 111 b – Click on the **Items** tab and click on **Map 0** to highlight it. **This means that on your main map which is **Map 0**, you will highlight the area shown in the inset map*.

Step 112 – Scroll down and click on the **Overviews** section.

Step 113 – Click on the green plus sign and in the drop down list next to **Map frame** select **Map 1**.



You will now see on your map the area in the inset map highlighted in red. If you would like to change the color for the highlight, you can do so by clicking on Change… next to Frame style.



Step 114 – Add the rest of the important parts of a map. If you don't remember how to do this, go back to **Chapter 10 step 62 – 96**.

Step 115 – Once you are satisfied with your map save it as a **jpeg** image.

Congratulations

You have created a database, shapefiles and gave it some attributes; you also created an ecosystem map, used different symbols, and categorized each ecosystem using different colors. You also labelled each ecosystem and created an inset map. Well done!

Now that you are more familiar with creating maps and symbolizing your data Chapter 12 will give you some simple definitions and examples of disasters, risks and vulnerabilities. Before you actually go out into your community and collect data you will need to learn about the hazards and vulnerabilities in your communities.

Chapter 12 – What are disasters and vulnerabilities?

Objectives:

By the end of this Chapter, you should be able to:

- Define and give examples of disasters.
- Define and give examples of vulnerabilities.

**This chapter provides simple definitions of disasters, risks and vulnerabilities. You will use this information to decide on what kind of risks and vulnerabilities do you want to map*.

The most common disasters.

Natural disasters are natural events that cause damage to humans and their properties. Different disasters are different in the way they affect our lives. Some disasters happen more often than others and some cause more damage than others. Let's look closely at some of the common disasters that your community may be facing. There may be other disasters, vulnerabilities that your community is facing which you can list in the next chapter.

1. Flooding

Floods are the result of long periods of heavy rainfall. During a flood event, a lot of buildings and crop land are covered with water.

2. Drought

Drought is one of the deadliest types of disasters because it is usually associated with heatwaves and bush fires. During a drought period, there is very little rainfall causing water shortage, damage to crops and livestock.

3. Epidemic

Diseases are a well-known disaster that has a major impact on human lives. An epidemic is when there is a widespread occurrence of an infectious disease. For example, dengue, typhoid, yellow fever, small pox, flu, hepatitis, cholera and diarrhoea.

4. Windstorms

During cyclone season, flooding can be caused by hurricanes and tropical cyclones. Windstorms causes damages to buildings, power lines, and crops by strong winds, the heavy rain and strong waves often causes flooding and damages to roads.

5. Earthquakes

Earthquakes are violent movement of the ground. Tsunamis are large waves that are created by earthquakes. It is important to have an evacuation area in the community in case there is a tsunami warning.

6. Landslides

Involves a lot of ground movement of soil, rocks and water downhill.

Have you ever experienced any of the disaster named above?

Vulnerability

For the purpose of this tool-kit, Vulnerability is how easily someone or group of people are affected by something such as a natural event. The most common vulnerabilities are:

7. Water security

- Not having enough water throughout the year.
- Water is contaminated.
- Poor water storage.

8. Food security

- Gardens are on land that is likely to be affected by flooding or drought.
- Not enough food available throughout the year.

9. Coastal

- Sea level rise.
- Coastal flooding.
- Eroding of coastline.
- Saltwater in the soil.

10. Ecosystem degradation

- Soil erosion.
- Riverside flooding.

* *If your community has experienced one of the disasters named above and has two or more of the vulnerabilities, then your community is very vulnerable. For example, if your community experiences flooding and food security is a vulnerability then your community is very vulnerable. This is because every time it floods, the crops and areas for planting will be under water. That's how you can create a risk map for your community to show the areas and people that are at risk*!

In the next couple of chapters you will need to identify the types of disasters that affect your community.

Chapter 13 – Data Collection

Objectives:

By the end of this Chapter, you should be able to:

- Identify the vulnerabilities that your community is experiencing.
- Draw hand drawn maps of your community.
- Collect specific and relevant data.

This chapter will guide you on how to collect and present data of your community.

Key terms

Risk – How likely it is to lose something that has great value.

Disaster risk map – A map showing areas including people's homes, food and water sources that has been affected by a natural disaster or event.

This section will show you what kind of data you need to collect to create a disaster risk map. The information that you will collect is very important for decision making and it will be stored in your community. The information can also be shared with your government and other organizations for assistance to reduce the impacts of natural hazards in your community.

In order to collect the correct type of data to be mapped, you need to think carefully about the following things:

- What do you want to be mapped?
- What type of data are you going to collect?
- How are you going to collect it?
- How long will it take for you to collect it?
- When will you collect it?
- How many people will you need to help you?
- What will you do with the data after you have collected it?
- Who will your present these data and maps to?

The first thing that we want to do is identify the things that are important to your community and have been or will be affected by natural disasters. For example; areas where people live, sources of water, waste disposal areas, plantations and sources of food. To make mapping on QGIS easier, you will need to create a hand drawn map of your community first.

13. 1 – Identifying areas at risk

Step 1 – The first thing that you are required to do is **identify the vulnerabilities** that your community suffers from. The table provided below (there is also another copy at the back of this booklet in the Appendix) is an example of how you can identify the vulnerabilities in your community. Start with the one that has the greatest impact on your village. You will use the information in this table to create your map.

Name of vulnerability	Name areas/buildings in your village that have been affected.
1. Water security	- Church has no water supply - All houses East of the church are not connected to the water supply
2. Flooding	- All houses along the coasts including the school and medical center.

*Keep in mind that you want to map the issues or problems that your community is facing. For example, if the issue is water what do you want to show? How many houses have access to water? What are the current sources of water for each household? If the issue is flooding, which areas are affected by flooding? Plantation areas? Households? How many? These types of questions will help you collect the type of data that you want to map.

13. 2 – Creating a hand drawn map of village

• Before you create your hand drawn map of your village/community. You are now going to see an image of your community.

**For users that have access to internet and do not have an image of your area of interest go to Chapter 19 – 21. These chapters will guide you on how to download and georeference an image of your study area*.

Step 2 – Start QGIS and click on the **Add Raster layer** to add an image of your community. Always remember, that in order for you to be able to add an image you must click on the **Add Raster Layer** tool.

Step 3 – Once the **Open a GDAL Supported Raster Data Source** window pops up, go to your Documents folder.

Step 4 – Go to the **Community Shapefiles** folder and open the Images folder and click on the image of your community to add it to your map.

- You should be looking at an image of your village. Are you able to identify any building in your village? Can you see where your house is? What about the building that you are in?

Step 5 – Now click on the **Add vector layer**  .

Step 6 – Open the buildings folder and click on **Buildings.shp**.

Now you see that the buildings in your village are represented as **points. Study this image carefully as you are going to use this image to help you create a hand drawn map of your village*.

You will now create **two** hand drawn maps of your village.

To watch a video on how to create a hand drawn map of your community, go to the **Video Tutorials folder and open the video file named **Chapter 13 Disaster Risk Map 1***.

Take one of the provided charts or a piece of paper and with a marker or a pen write the title **Disaster Risk Map 1 of (name of your village)** as the title for your map.

Step 7 – On the chart, draw a map of your community. Start by drawing the roads or paths around your village (if there are any).

Step 8 – Draw all the buildings (includes houses, shops, church, school and medical centre and any other building) in your village. Start by drawing the buildings next to the roads and work your way from there. If your village however, does not have any roads you can start drawing the building you are in and work your way from there. (You may refer to the image on QGIS if you need to).

- Draw **circles** to represent **shops**.
- Draw **squares** to represent **households**.
- Draw **triangles** to represent **schools**.
- Draw **an X** for a **hospital or medical centre**.
- Draw **a cross** for **church buildings**.
- Draw **a star** for **village halls and other buildings for social gatherings**.
- Shade areas where the village gardens and plantations are located. Use different types of shading to show different types of crops planted in each area.
- When you are done, create a key or a legend for your map.

Step 9 – Now that you have created a hand drawn map of your village, stick it to the wall so that everyone can see it. You will work with it later.

Now it is time to create the second map of your village.

**To watch a video Tutorial on how to create the Disaster Risk Map 2, go to the Video Tutorial folder and open the video file Chapter 13 Disaster Risk Map 2*.

Step 10 – Draw all the buildings like you did for your first chart and give it the title **Disaster risk map 2**. Do NOT draw the garden areas on this map.

Step 11– Draw **dotted lines** around the areas and buildings that are affected by each natural disaster or vulnerabilities. Use the information that you listed in the table of natural disasters (Chapter 12) affecting your village to help you.

Step 12 – Label or shade each area so that you know which areas are affected by each natural disaster (some areas may be affected by more than one, so the lines may overlap).

Step 13 – Do this for all the areas affected by each natural disaster.

Step 14 – Make sure to add a legend to your map.

Step 15 – If there is an area that is affected by two or more natural disasters, this area is the most at risk. Is there an area that is at risk?

Step 16 – Are there any buildings and plantations near or in this area? How many?

Step 17 – Stick this second map on to the wall as you will work with it later.

Congratulations

You have created hand drawn disaster risk maps of your village.

13. 3 – Data Collection

Now you will collect data from your community and also check whether your maps are correct. You will need at least 6 people to help you collect the data. The data that you are going to collect will be based on the buildings in your village and areas affected by the natural disasters that you have identified. You will need to take with you the Data Collection survey sheet (at the back of this guide) and your sketch maps.

Divide yourselves into two groups (3-4 people). **Group 1** will focus entirely on collecting household data using the survey sheet and the Disaster Risk Map 1. **Group 2** will focus on checking whether your Disaster Risk Map 2 is correct. That is, check whether the affected areas drawn on the map is correct.

Group 1 task.

At the back of this guide, you will find a survey sheet with the title **Data collection survey sheet in a table form that you will use to collect the household data*.

Step 18 – Take out the survey sheet now and read through it so you know what type of questions you will need to ask and the type of data you will be collecting.

**To watch a video tutorial on how to fill in the survey sheet go to the Video Tutorial folder and open the video file named Chapter 13 Data Collection Survey Sheet*.

- You need to be careful with the type of data you enter into your table. If you enter the wrong information, it may result in creating data and a map that is unreliable!

- You are going to walk around your village and collect information in the survey sheet from every building. If it is a household, ask a member of the household if they can provide you with the information in the survey sheet. It is very important that the data you collect is true.

- Let's look at how you are going to record the data you collect in the survey sheet.

- For the first column, this is where you will number each household with an id number. The first building you will start with is the building that you are in right now. So, for the first row in the survey sheet, you will fill in the column Id no. with the number 1. So the next building you will go to will have id number 2, the next one will be 3 and so forth. Do not write the numbers in words!!

- Fill in the rest of the row moving across.

Every time you fill in the id number for a building on to the survey sheet, locate that building on your sketch map and with a pen write the same id number next to or on the building on your map. In this way, you know exactly which building on the map matches the information on your survey table.

For example, in the table below the first building is a household with the id number

1. On your map, the first building will have 1 on it or next to it.

	Id_no	Building_type	Owner	No_of_males	No_of_females
2	1	Household	Sisi Uno	3	4
3	2	Household	Paul Rakai	3	5
4	3	Household	Sese Fano	5	6

- For the Building type, this is where you will fill in whether it is; a household, a shop, a church, village hall and so forth.

- For the Owner, fill in the first and last name of the owner of the building.

- Note that the two columns No. of males and females only applies to households (so if it is a classroom, medical centre, village hall or shop just enter NA).

- Number of disabled persons, this column is to be filled with the number of people that are physically or mentally disabled in this household.

- Source of water 1, what is the main source of water for this building. Tap, well, spring, stream, river or rainwater?

- Source of water 2, this only applies if the building has more than one source of water that is not the same as Source of water 1. If the household only has one source of water then just write NA in this column.

- Do the same thing for the source of food. For Source of food 1 only name ONE. For example plantation or import or seafood.

- Own a plantation, Either a Yes or No.

- Type of toilet, fill in whether it is Flush, Water sealed, Pit or None.

- Septic tanks, fill in whether it is either Sealed OR Unsealed.

- For the Roofing material, fill in what the roofing material is made of. It could be iron, wood, coconut leaves or bamboo.

- For Affected by Natural disaster, fill in with either Yes or No.

- Name of disaster that affects the household.

- Number of persons injured from disaster. Fill in how many people in this household were injured by the named disaster.

- Number of deaths as a result of this disaster. Fill in how many people died as a result of this disaster.

- Common diseases 1 and 2 fill in at least three common diseases that were or DIAGNOSED by a doctor for this household. For example, flu, dengue or any other disease.

- Common diseases 3 and 4 fill in at least three common diseases that were treated with traditional medicine and NOT diagnosed by a doctor.

- Highest education level, this only applies to the households. So find out what is the highest education level in that household. For example, University, Form 7, class 8.

- It is very important that you number every building with an id number starting from 1. At the end of this exercise, the id number will tell you the total number of buildings in your village/community.

Step 19 – Once you understand what type of data to collect, questions to ask and how to fill in your survey sheet you should now prepare to go into your community.

Group 2 task.

Step 20 – Use your sketch map **Disaster Risk Map 2** to help you walk around your community. As you walk around your village edit your map. If there is a building that you forgot to draw on your sketch map, you can add it as you go along. Edit the position of the roads if you need to. Check whether the affected areas on your map are correct.

Step 21 – Label the affected areas correctly.

Step 22 – Once you are finished, compare your map with the other sketch map. See whether both maps have the same number of buildings and the correct number of buildings is in the areas at risk.

Step 23 – Keep these maps as you will need to enter them into a spreadsheet.

**Once you have finished collecting all the data, you will need to organize your data onto a spreadsheet. Chapter 12 will guide you on how to properly organize your data.*

Congratulations

You have successfully collected specific data to create a disaster risk map for your community.

Chapter 14 – Transferring collected data to QGIS

Objectives:

By the end of this Chapter, you should be able to:

- Create new point, line and polygon shapefile with attributes to represent the data you have collected.

** To watch a video tutorial for this chapter, open the video tutorial labelled Chapter 14.*

14.1 – Creating a polygon shapefile to represent areas at risk

Part 1 – Creating a new polygon shapefile

You are now going to add the data you collected on vulnerabilities or the areas at risks. In order to add this new data, you need to create a geodatabase so that all the data is organized in one location.

Step 1 – Start QGIS and create a geodatabase and give it an appropriate name e.g. the name of your community. **If you do not remember how to create a geodatabase, go to Chapter 11.1 and follow the instructions*.

Now you will need to create a polygon shapefile to represent the areas affected by the natural disasters or vulnerabilities that you listed.

Step 2 – Create a new polygon shapefile and name it **Area at risk**.
Go to Layer > Create Layer > SpatiaLite Layer *(see Chapter 11.2).*

**Make sure you select the database that you had just created to be the database where this polygon shapefile will be saved*.

**If there are more than one area affected than you will be creating more than one polygon*.

Make sure to specify the coordinate system (CRS). If you are not sure what coordinate system to use, on the **Layers window right click on the image and select **Properties**. Click on the **General** tab and see **Coordinate Reference System**. You should be able to see what coordinate system the image is in, this is the coordinate system that you need to use for every shapefile you create using this image*.

**Check the box next to Create an autoincrementing primary key*.

14.2 – Creating attributes for each shapefile

Step 3 – Create a new Attribute and name it **Vulnerability**. Click on **Add to attribute list** and select **OK**. *(This means that you are creating a polygon to represent the areas that have been or is affected by the disasters or vulnerabilities you have named. Also you have created a new attribute and named it Hazard which will be a column in the attribute table and it will be named Area).*

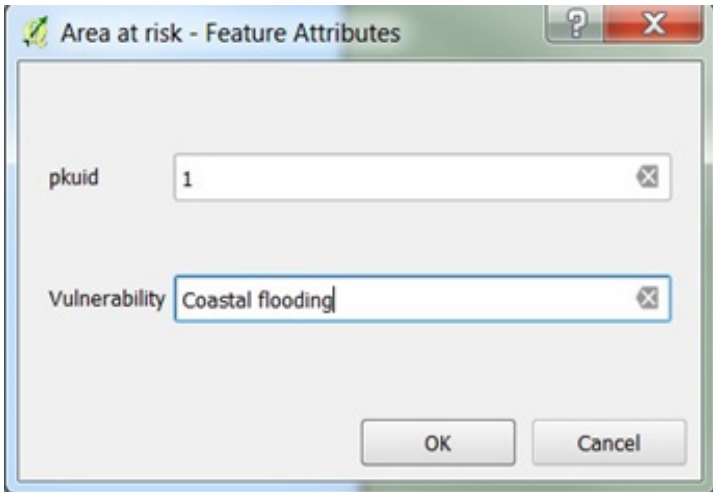
Step 4 – In the layers window, right click on the new Area at risk polygon shapefile and select Attribute table. Can you see the attribute (Vulnerability) that you just created? Close the Att ribute table window.

Step 5 – In the Status bar, set the scale to **1:2000**.

Step 6 – Click on the **Area at risk** layer to highlight it and click on the **Toggle Editing** tool to start an edit session.

Step 7 – Click on the **Add Feature** tool and on your map start drawing (digitizing) the area to represent the first vulnerability (if there are more than one). **Refer to chapter 12 if you have forgotten how to do this*.

Step 8 – When you have finished, right click and enter an id number and name of the vulnerability in the **Area at risk Features Attributes** window.



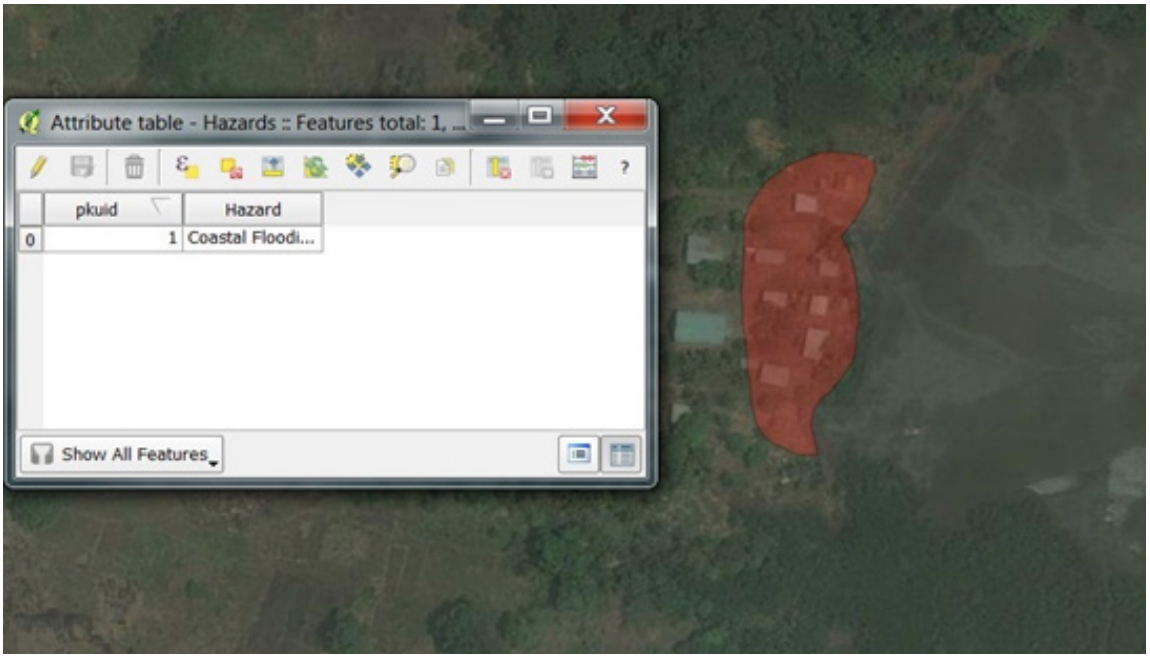
Step 9 – Click **OK** and then click on **Save Edits**.

Step 10 – If you are going to add another polygon to represent another vulnerability, follow instructions on **Chapter11.2 step 20 – 41 on Snapping options**.

Step 11 – Change the colour of the Vulnerability layer to red and change the Transparency to 70%.

Open the Attribute Table for this layer and see how it relates to your map. You will see that the attribute you created (Vulnerability) contains the information for this new polygon. In the image below, the polygon is the area that is affected by Coastal Flooding.

**By changing the transparency you can see the number of households affected by coastal flooding. Your community might face a different hazard other than coastal flooding but this is just an example*.



Step 12 – Do this for all the vulnerabilities you listed and areas that you and your team had drawn on your sketch map. **If you have more than one Area at risk, then you can symbolize it using different colours, See Chapter 11.3*.

**You can create other shapefiles if you think you need to. Such as important areas in your community or important trees that may be in the areas at risk boundary. (See Chapter 11 on creating point, lines and polygon shapefiles – remember to save it in the right geodatabase)*

Once you are done, you can save your map and close it.

Congratulations

You have added some of your collected data into your community geodatabase.

Chapter 15 – Organizing and saving data into a spreadsheet

Objectives:

By the end of this Chapter, you should be able to:

- Enter, organize and save collected data into a spreadsheet.

You are now going to organize and save the data that Group 1 collected into a spreadsheet. In Chapter 6 you learned how to enter and save information onto a spreadsheet. You are going to do the same thing, except you will be using the data you collected.

You can use either Open Office or Microsoft Excel, which ever one you want to use you will have the same results as long as you save your table as a .csv file. If you want to use Open Office, Part 1 will guide you on entering and saving your data on Open Office. If you want to use Microsoft Excel, Part 2 will guide you on how to enter and save using Microsoft Excel.

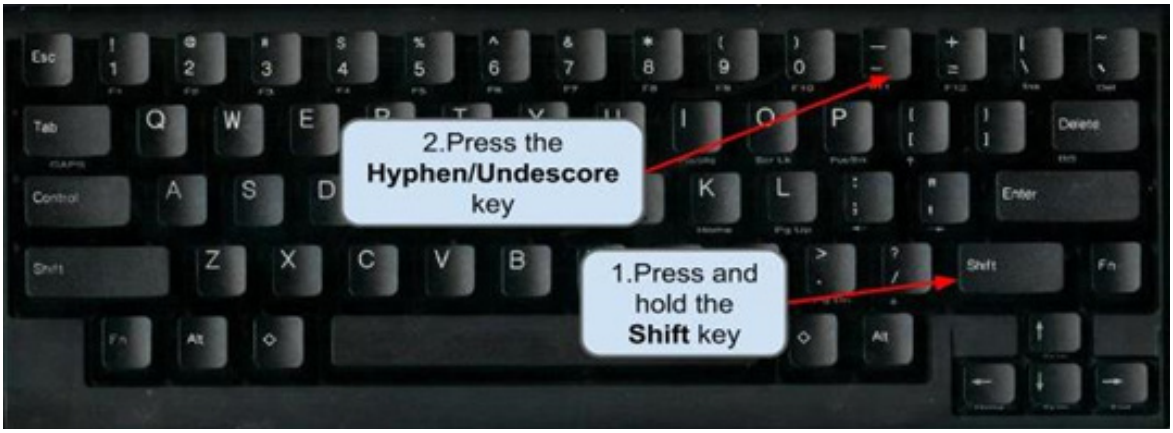
*To watch the video tutorial go to Video Tutorials and open the video file named Chapter 15.

15. 1 – Entering data into Open Office spreadsheet.

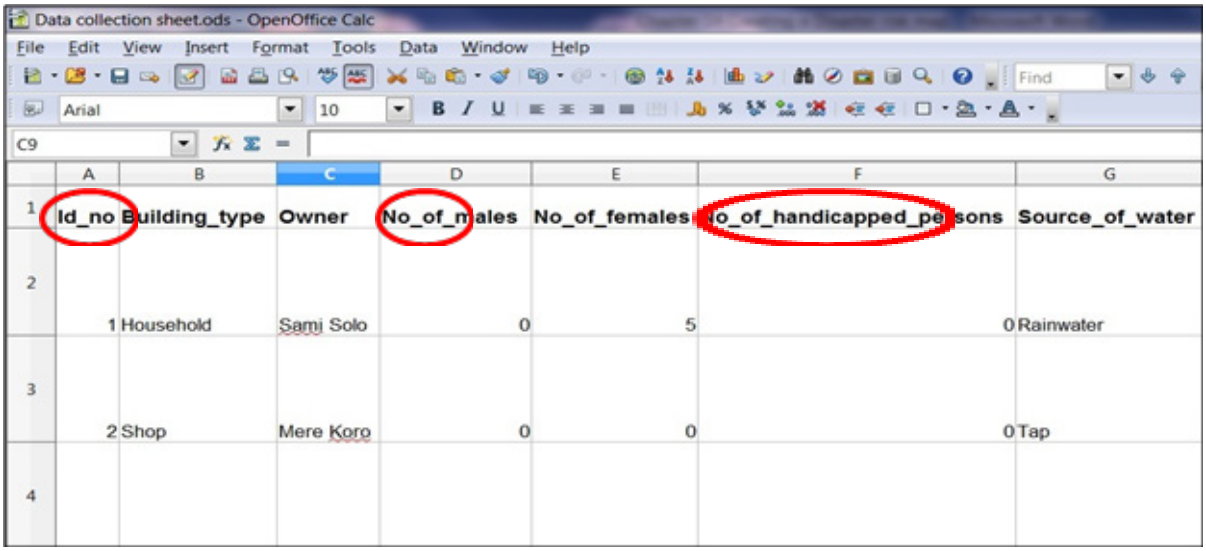
Step 1 – Open **Apache Open Office**.

Step 2 – Click on **Spreadsheet** to open it.

Step 3 – Enter the data you collected into the Spreadsheet.**When you type in the headings for each column make sure there are no spaces in between words, see image below*.



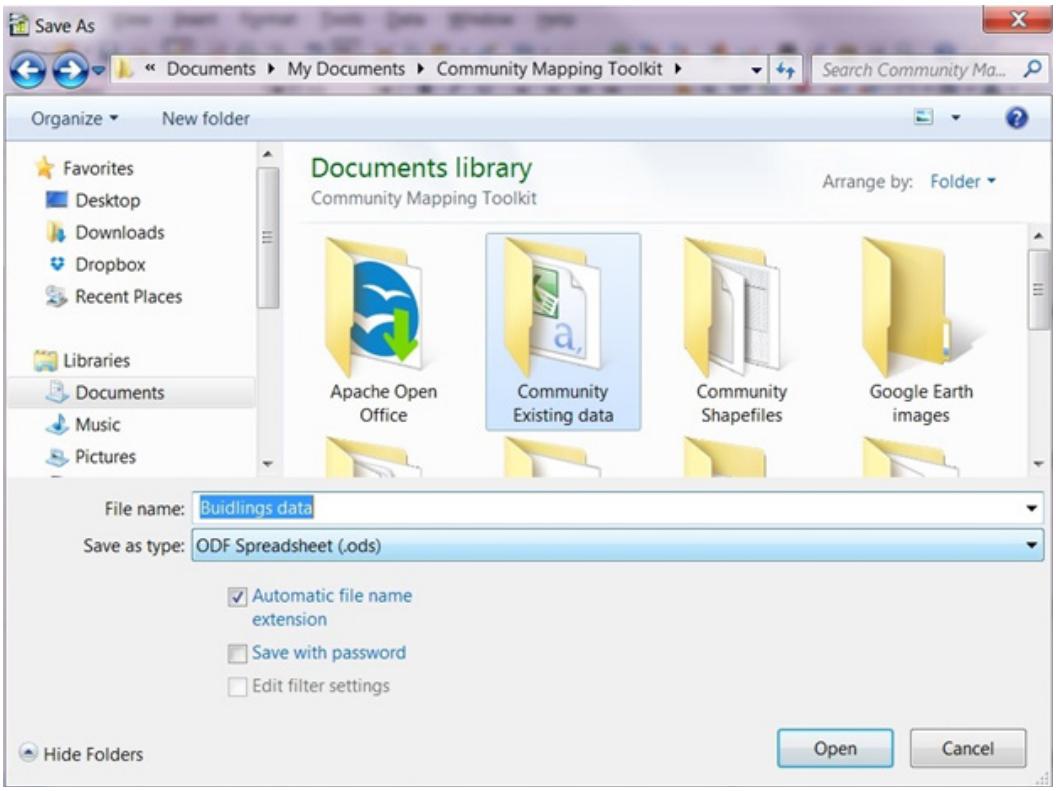
You can separate each word using an underscore by pressing and holding the Shift key at the same time press the **Hyphen/Underscore key**. *(The reason why you cannot leave spaces between the words in the headings is because any GIS software will have difficulty reading this with gaps in between words)*.



Step 4 – When you have finished, click **Save As**. Go to File > Save As

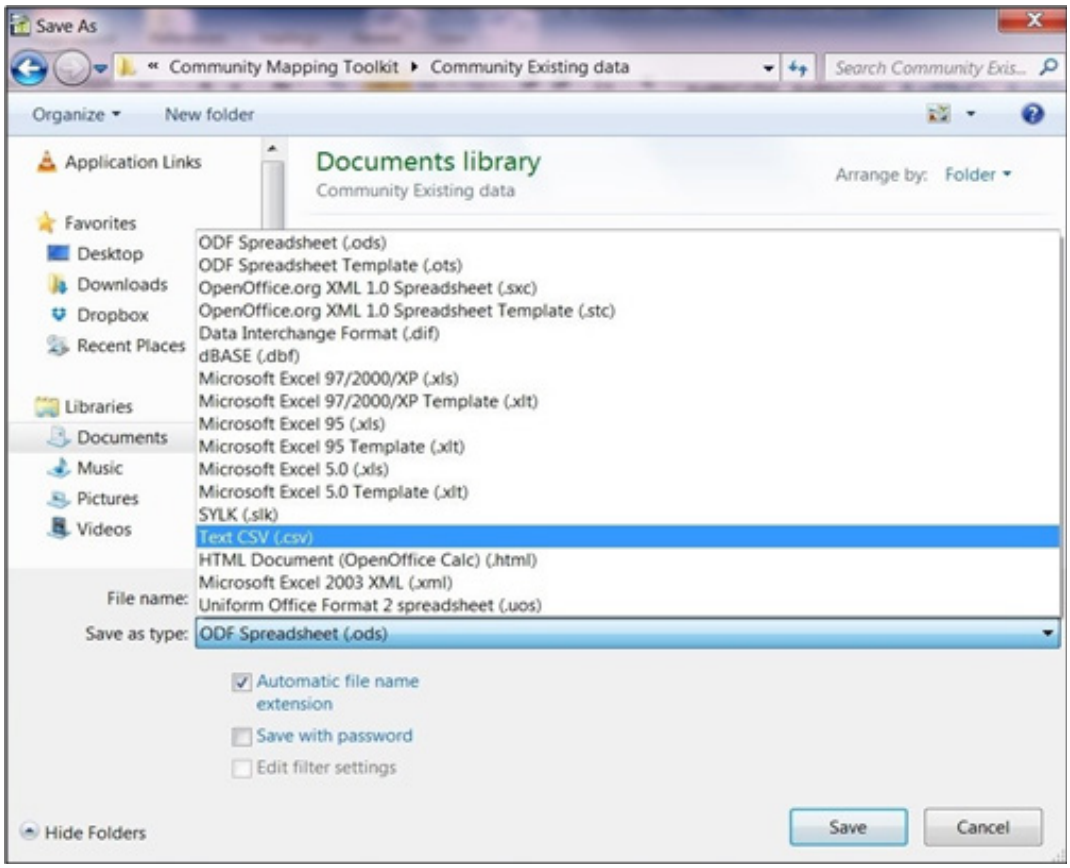
Step 5 – Go to your Documents folder and open the **Community Existing data** folder (this is where you will save your spreadsheet and any other spreadsheet containing data from your village).

Step 6 – Name the file **Building data**.



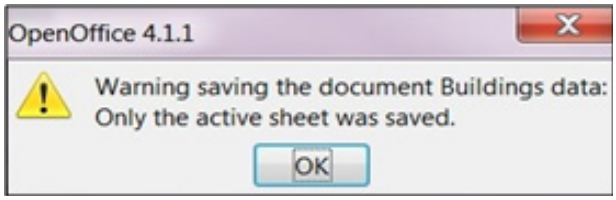
Step 7 – Click on the **Save as type** and in the list, select **Text CSV**. It is very important that you save it as a **Text CSV**, so that you are able to use this table in QGIS.

Note: For every table of collected data that you want to use for mapping you must ALWAYS save it in Text CSV file format.

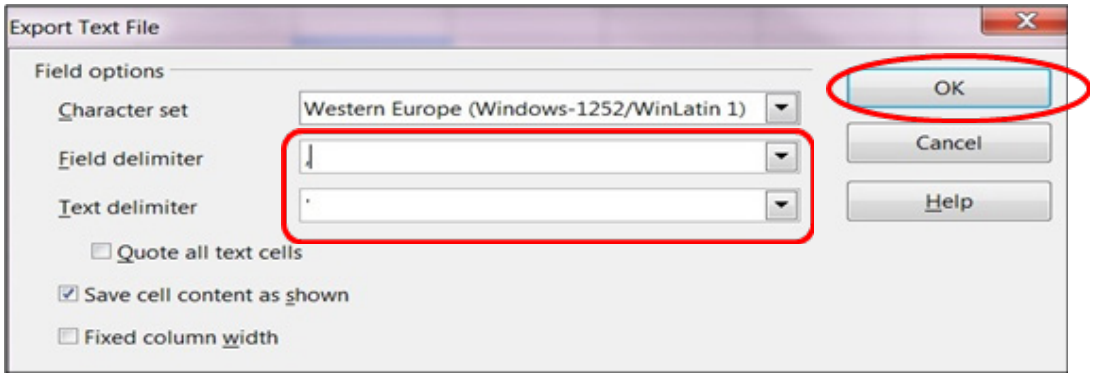


Step 8 – Click **Save**.

Step 9 – Click **OK** when the warning message appears.



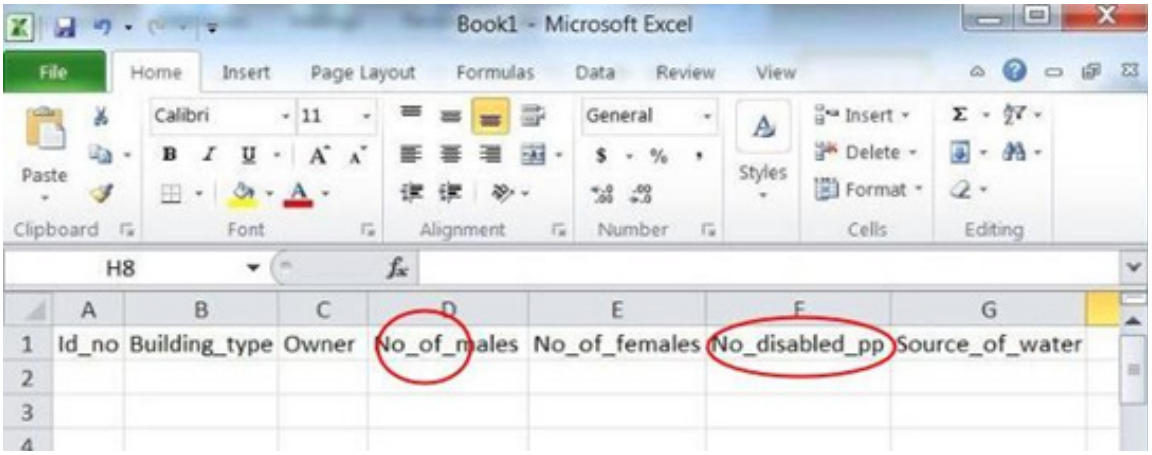
Step 10 – Click on the two drop down boxes next to **Field delimiter** and **Text delimiter.** On the Field delimiter select the comma and on the Text delimiter select the apostrophe. Click **OK**.



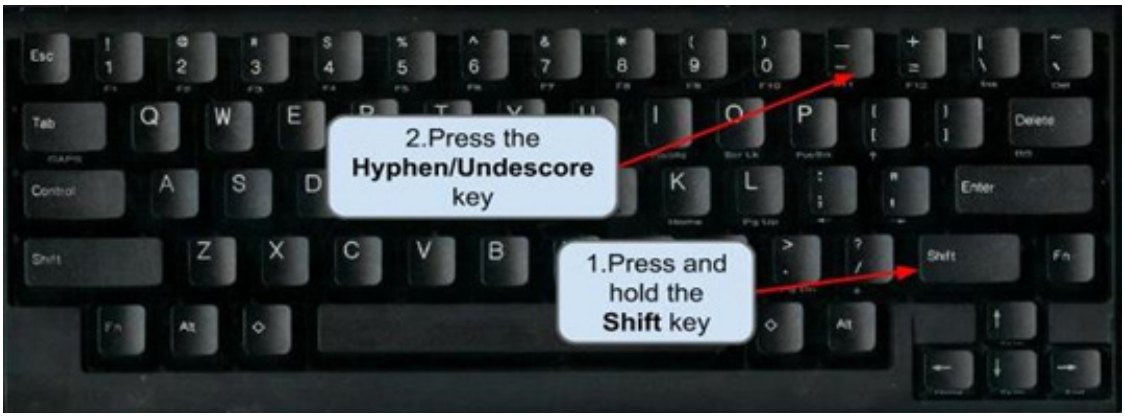
15. 2 – Entering data into Microsoft Excel spreadsheet

Step 1 – Start **Microsoft Excel** *(If you don't see **Microsoft Excel**, click on start and search for it in the Search tab by typing in Microsoft Excel. In the list that appears click on **Microsoft Excel** under **Programs**, see image below)*.

Step 2 – Enter the data you collected into the Spreadsheet. **When you type in the headings for each column make sure there are no spaces in between words, see image below*.



You can separate each word using an underscore by pressing and holding the **Shift** key at the same time press the **Hyphen/Underscore key**. **The reason why you cannot leave spaces between the words in the headings is because any GIS soft ware will have difficulty reading this with gaps in between words*.



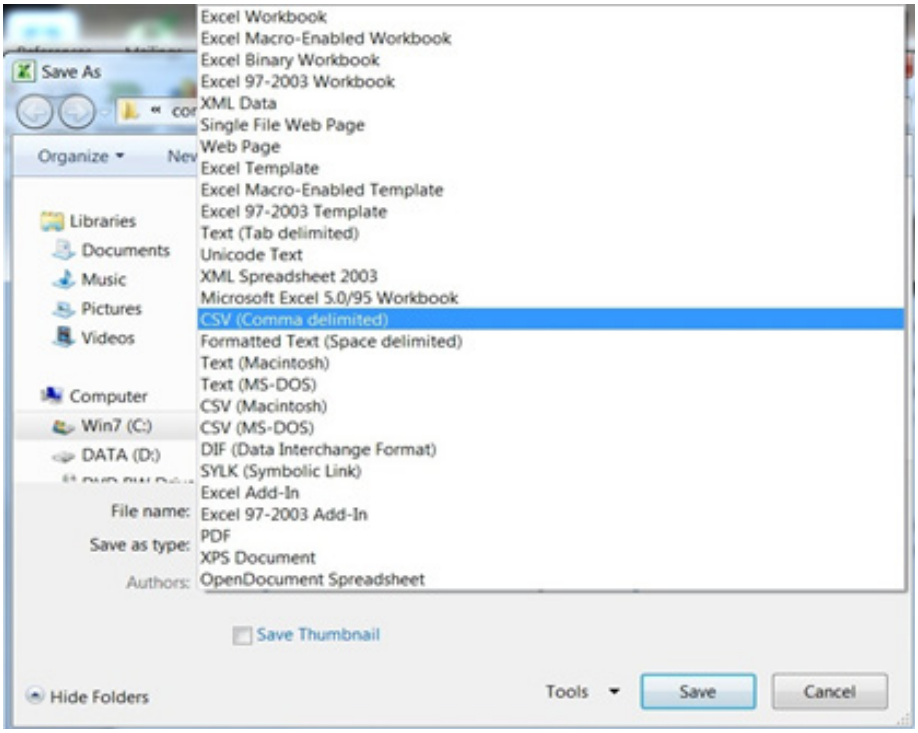
Step 3 – Once you have finished adding all the data, click on the **File** tab in the top left hand corner and select **Save As**.

Step 4 – Go to your **Documents** folder and save it in the **Community Existing data** folder. * *You may create a new folder if you don't have this folder or you can create a new folder and give it a different name – whatever makes you happy! If you have forgotten how to create a new folder go back to Chapter 6, Part 1 step 1 – 4*.

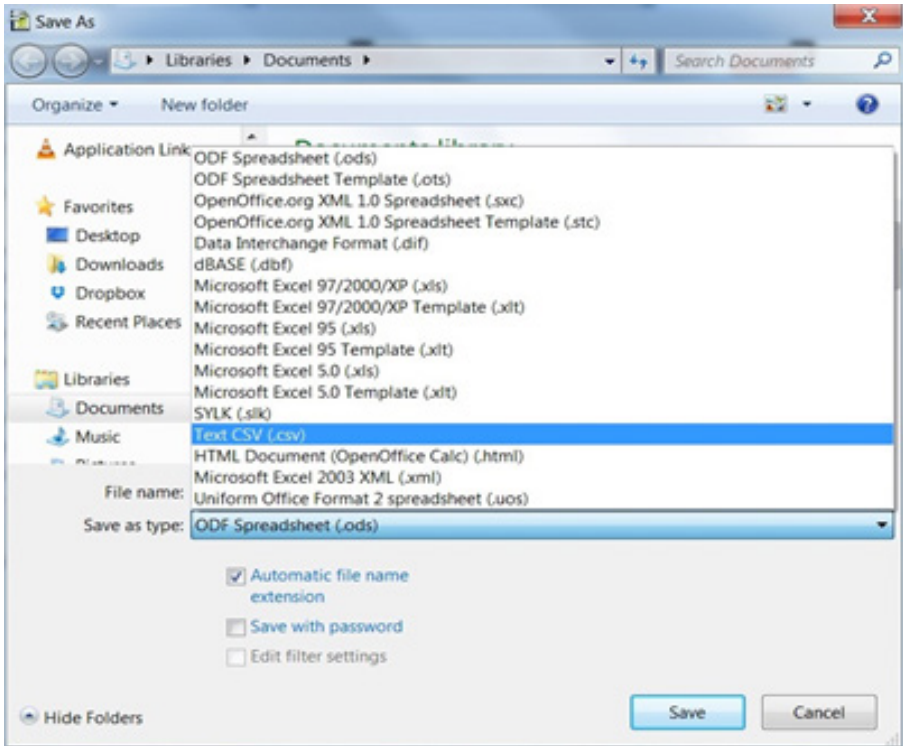
Step 5 – Name the file **Building data** (See Chapter 15 Part 1, step 6).

Step 6 – Save the file as a **CSV (Comma delimited)** file. **Saving the table in a CSV file format will allow it to be used in any GIS software. You will learn more about why it is important to save tables that will be used in GIS software in Chapter 17.* The following images will show you what to select if you are using either Microsoft Excel or Open Office.

**In Microsoft Excel you will CSV (Comma delimited) as shown below.*



**In Open Office you will see Text CSV (.csv) as shown below.*



Step 7 – Click **Save**.

Congratulations

You have successfully organized, entered and saved data that you collected into a spreadsheet that you can use in QGIS.

Chapter 16 – Editing and saving data on QGIS

Objectives:

By the end of this Chapter, you should be able to:

- Edit, delete, move and save features on QGIS.

*To watch the video tutorial, go to the Video Tutorial folder and open the video file Chapter 16 Editing and Saving.

16. 1 Editing the Buildings layer

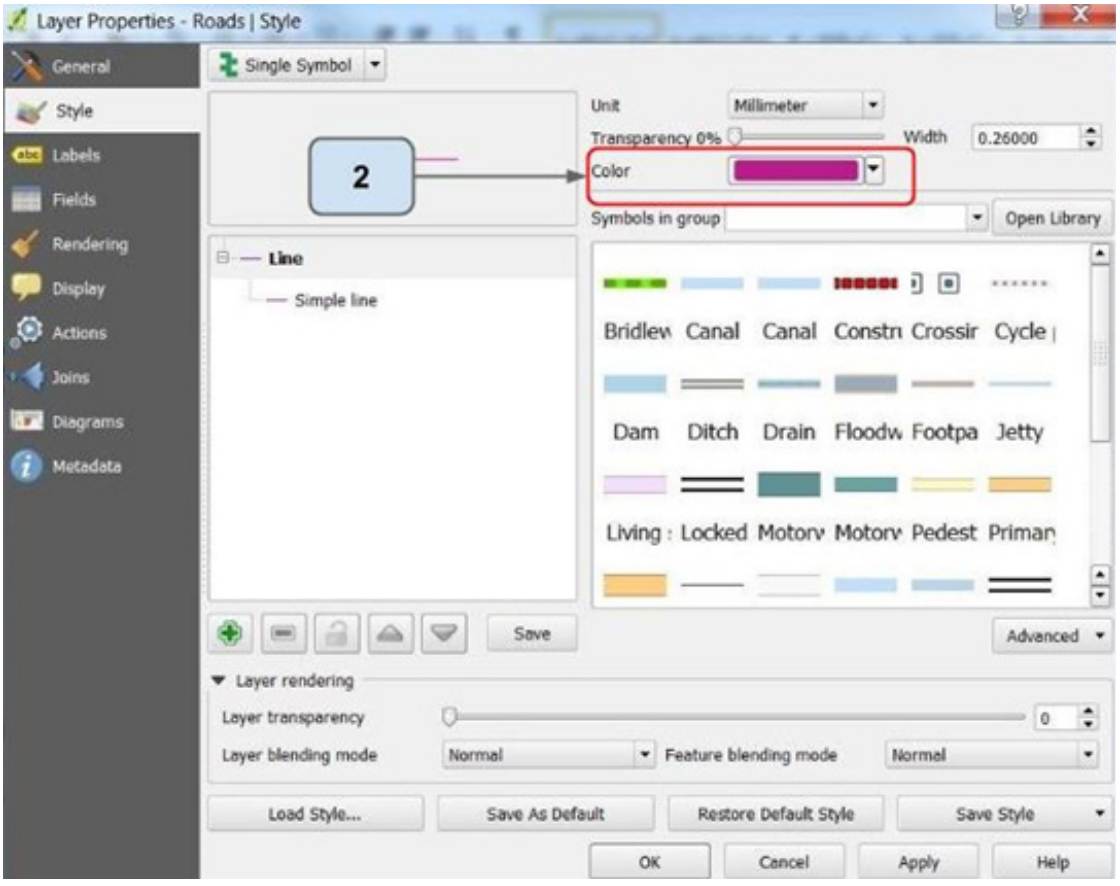
You are now going to enter the id number for each building using your sketch map to help you.

Step 1 a – Click on Add Raster layer and add the image of your community.

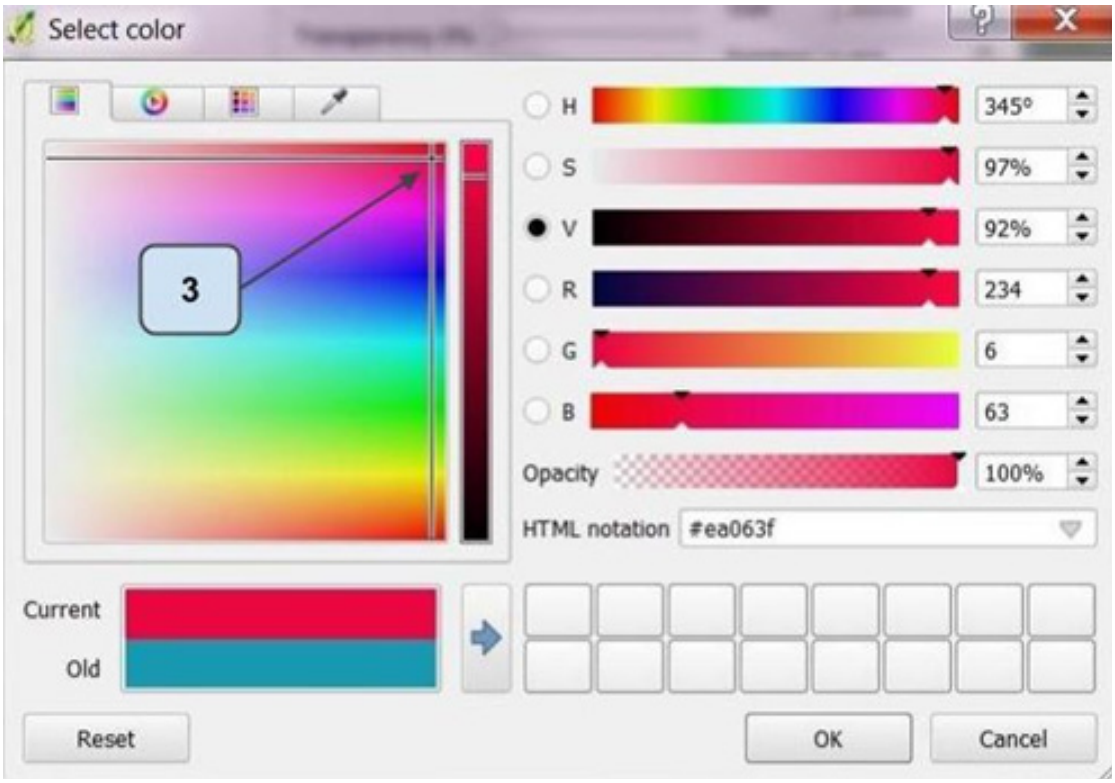
Step 1 b – Click on Add Vector layer and go to the Community shapefiles folder and add the buildings layer. **If you do not have a point shapefile, go to chapter 11.4 and follow the steps to create a point shapefile*.

Step 1 c – In the Layers window, double click on the **Buildings** layer (or whatever point shapefile you are working with) to open the **Properties** window.

Step 2 – Click on the colour pane to change the colour.



Step 3 – Click on the red part of the colour panel and then click **OK.**



Step 4 – On the Properties window click **Apply** and **OK**. All the buildings on your map are now red.

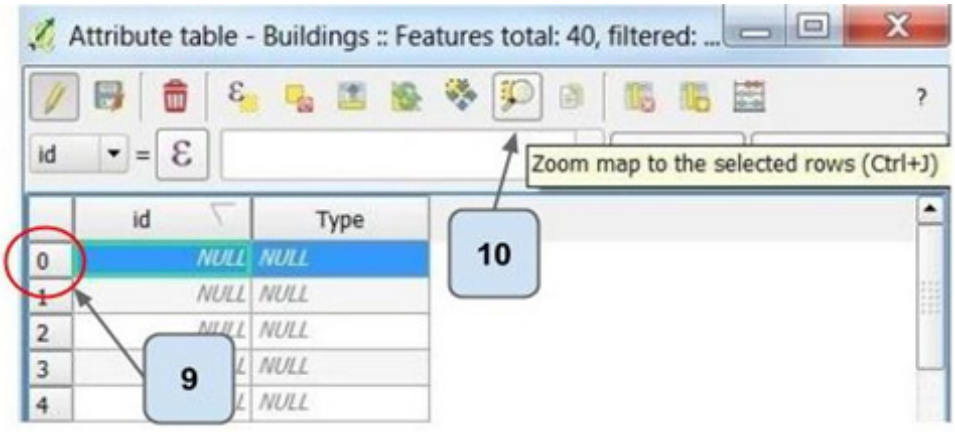
Step 5 – On the **Layers** window, right click on the **Buildings** layer.

Step 6 – Click on Open Attribute Table

Step 7 – Once the **Attribute Table** appears, click on the **Toggle editing** tool  so that you are able to make some changes and add data to the Attribute table.

Step 8 – Remember you wrote down the id number for each building on your sketch map. You will now use it to help you enter the id number for each building using your sketch map to help you.

Step 9 – Start with the first row on the Attribute table. Click on the **grey box** with the number 0 to highlight the row.

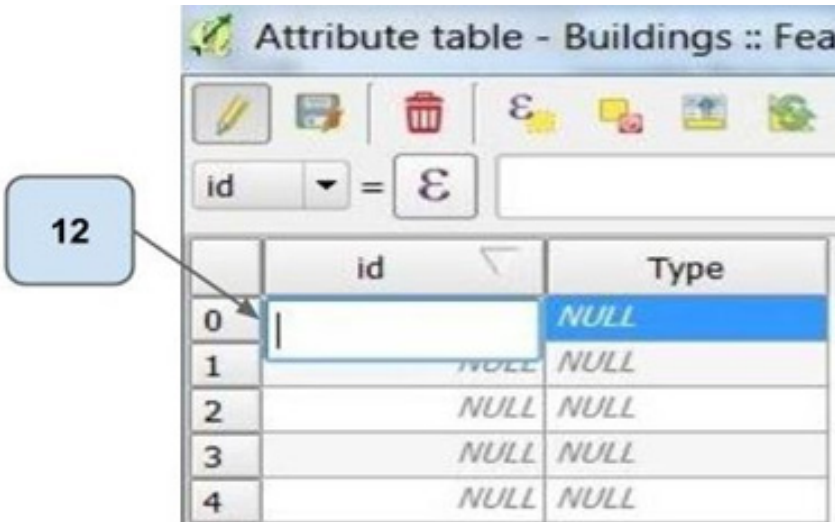


Step 10 – Click on the Zoom map to the selected rows and then minimize the attribute table. You should be able to see a point feature that is highlighted in white.

Step 11– Once you see the highlighted point feature, look at your sketch map to locate the same building and **identify the id number**.

Step 12 a – Once you know the id number for this building, double click on the first empty row in the **id column** to add the id number.

Step 12 b – Double click in the row under Type and enter the type of building. For example, household, church, shop and so forth. **Cross off** the buildings on your sketch map that you have entered their id number and type of building onto the attribute table so you know which buildings are left to be entered.



Step 13 – Do this for every row. Once you have finished, the total number of buildings in your sketch map should match the total number of buildings in your attribute table is the number of buildings on the Table of Attribute the same with your sketch map? If there are differences in the number of buildings or the location of buildings you will now edit it. **If there are some buildings that need to be added, you can add a point feature*.

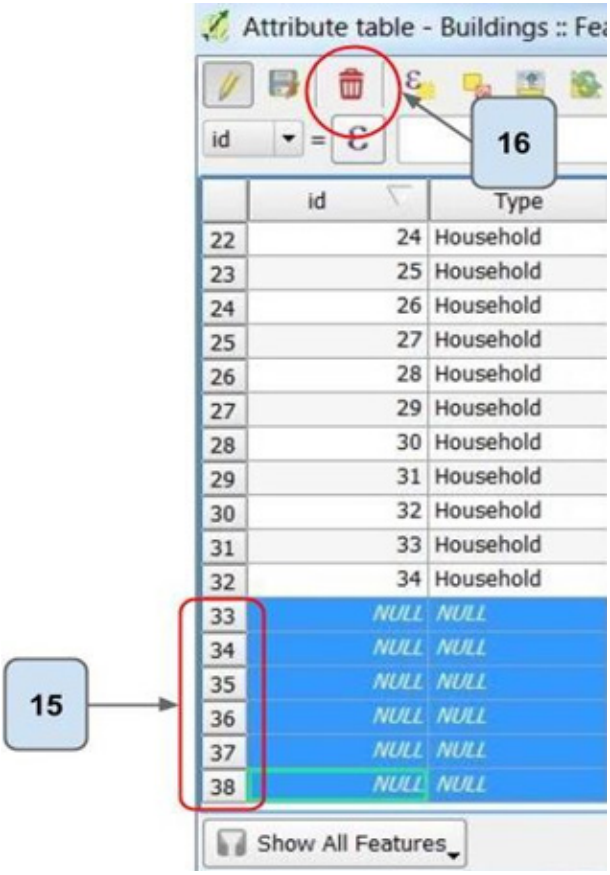
16. 2 Deleting a feature.

If after entering all the id number in the **Attribute Table you notice that you still have extra rows like the image on the next page, you can delete them*.

Step 14 – Click on the **Toggle editing**  tool.

Step 15 – Click on the numbers on the side to highlight the rows.

Step 16 – Click **Delete Selected Features** and **Save Edits**.



Step 16 – Click on **Save Edits** to save all the changes you made and then close the attribute table. You will now notice on your map that the point features has now disappeared.

If you would like to work on your map later, save your project. Go to F**ile > Save As**... and save it in the **Projects** folder.

**By now you should be able to understand how the information on the Table of Attribute is linked to the features on the map*.

Congratulations

You have just edited the data you collected and will be used to create you risk maps.

Chapter 17 – Creating a Disaster Risk Map

Objectives:

By the end of this Chapter, you should be able to:

- Add a .csv file to QGIS.
- Manage and join tables of data.
- Perform a query and create new shapefiles
- Create a risk map on QGIS.

Now that you have collected, edited and organized the data about the things that are important in your village, you can create a map to show areas that are at risk. Your map will be very useful so that people in your community can better understand the risks. It is also useful for other organizations and your local ministries and government.

17. 1 – Adding a csv file

Step 1 – Start QGIS, click on **Add Raster layer** and add the image of your community.

Step 2 – Click on the **Add vector layer**. Go to the **Community Shapefiles** folder and add the **Buildings.shp**. If you had created other shapefiles that you would like to include in your map you can go ahead and add it.

Step 3 – In the layers window, make sure that **Buildings** (points or lines) are on top of the image or if you have added polygons.

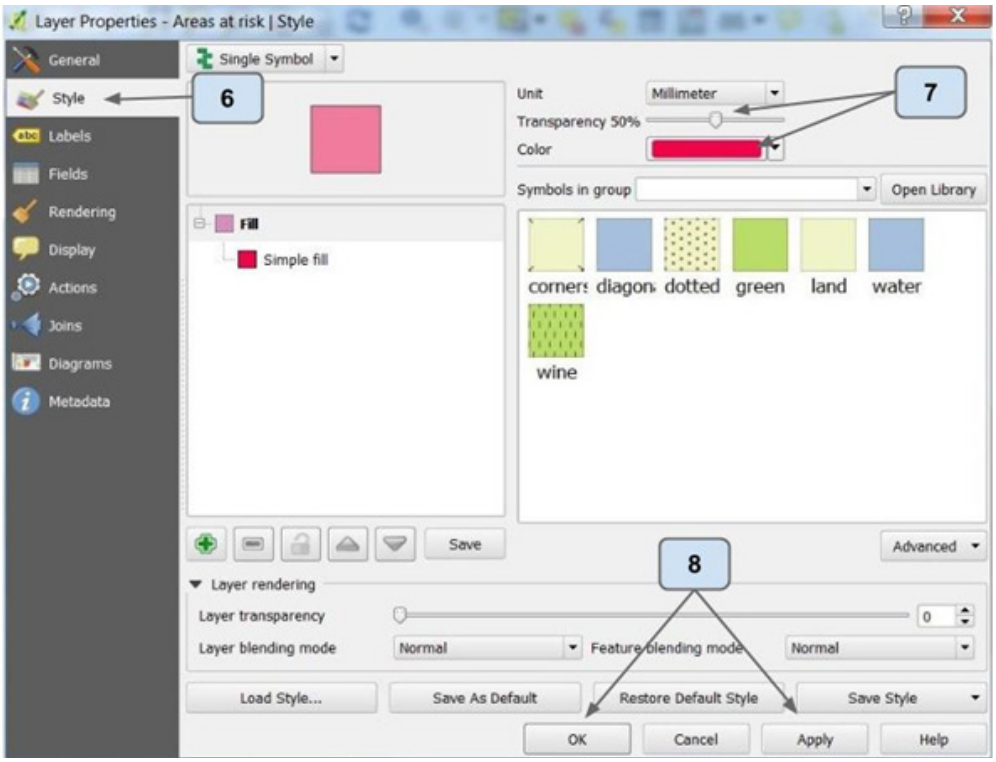
Step 4 – Now, add the **Areas at risk.shp** that you created. In the Layers window, make sure the Areas at risk layer is on top of the Village boundary layer.

Step 5 – Double click on the **Areas at risk** layer to open the properties window.

Step 6 – On the **Layer Properties** window, click on **Style**.

Step 7 – Change the colour to red and set the **Transparency to 50%**.

Step 8 – Click **Apply** and then **OK**.

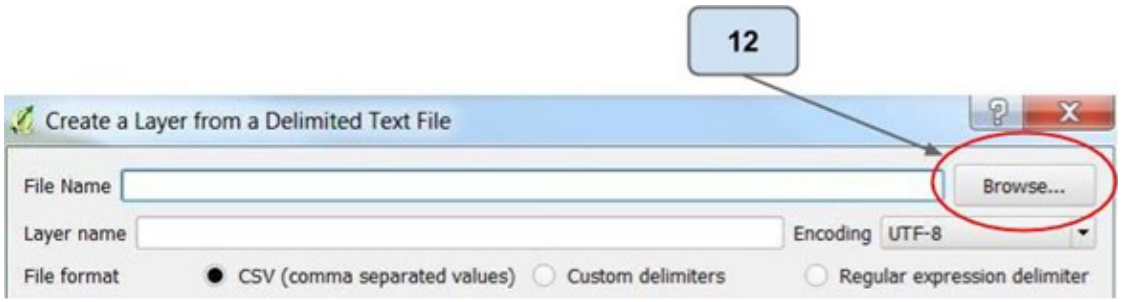


Step 9 – Right click on the Buildings layer and open the attribute table, notice how there aren't any data in it that you can use? Close the attribute table.

**Let's add the spreadsheet table that you created onto our map and see how we can use it*.

Step 11 – Click on **Add Delimited Text layer**. **Whenever you want to use a spreadsheet of data that you created, always click on **Add Delimited Text** layer to add it to your map*.

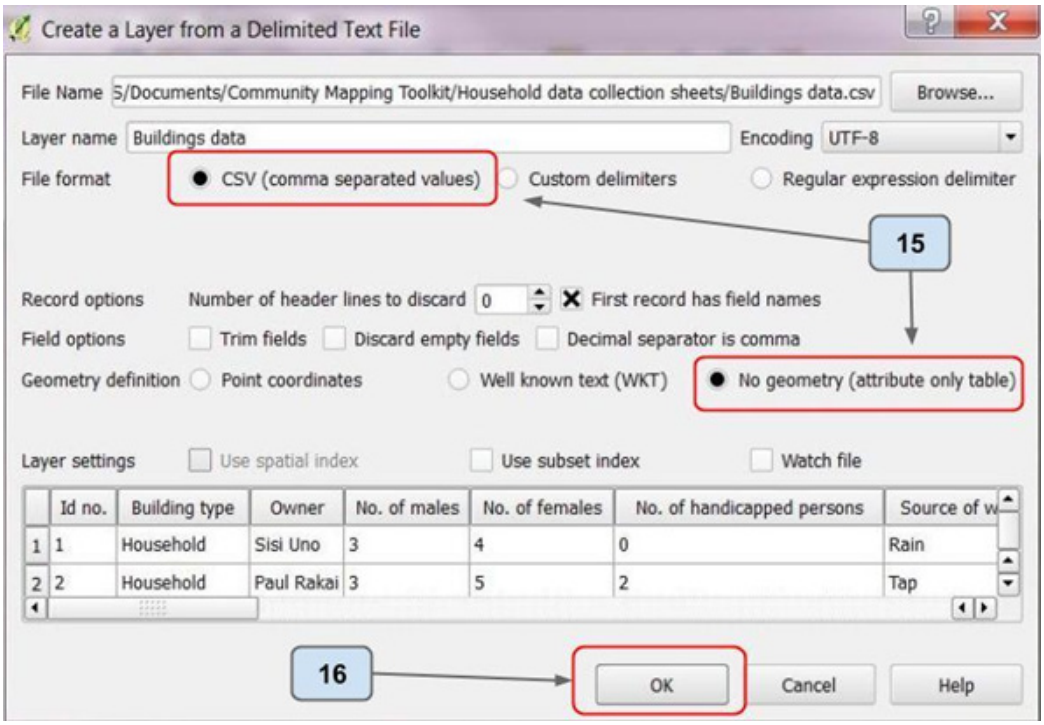
Step 12 – Click on the **Browse tab**.



Step 13 – Go to the **Buildings data** collection sheets folder, to where you saved the spreadsheet data on the buildings that you collected.

Step 14 – Click on the **Buildings data.csv** file and click Open.

Step 15 – For **File format**, select **CSV** and select **No geometry** (attribute only table). **Remember when you saved your spreadsheet you saved it in a csv file? The reason why it was important that you save it as a csv file is so that the QGIS soft ware can read it*.



Step 16 – Click **OK**.

- You will notice a new icon on the layers window on QGIS. This is the Buildings data table that you will use to create your map.

17. 2 – Joining tables.

- The table that you just added has the information on the buildings in your village. But before you can use this table and the information in it you will have to join this table to the buildings layer.

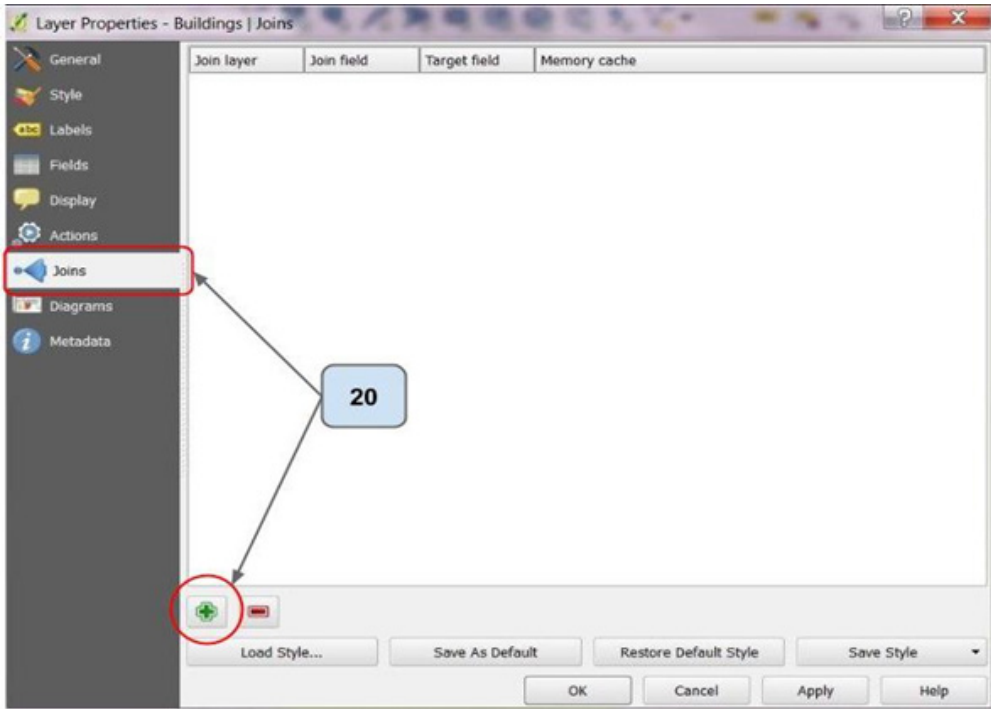
Step 17 – Right click on the Buildings data table that you have just added and open the Attribute table.

- In order for you to be able to **join this table to the Buildings attribute table**, they both must have at least **one column heading that is the same (common field)**.

Step 18 – To join the two tables, we are going to join them using the **id columns**. **This is why it is always important that the features have an id number*.

Step 19 – Double click on the **Buildings** layer to open the **Properties** window.

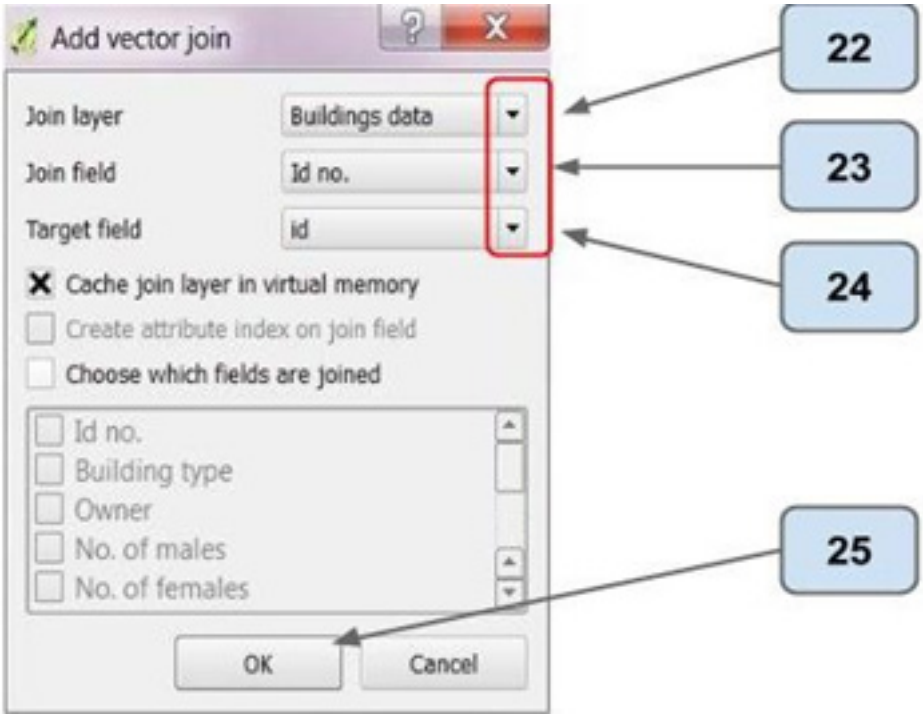
Step 20 – Go to **Joins** and click on the small green plus sign at the bottom.



Once the **Add vector join** window appears, you need to select the **layer** that you want to make the join with. In this case, you want to join it with the **Buildings data** table (so you are joining the **attribute table of the Buildings layer** to the **Buildings data table**).

Step 21 – To do this, just simply click on the small arrow next to **Join Layer** to show the list of layers and select **Buildings data**. This means that you are going to join the Buildings data table with the Buildings layer.

Step 22 – Next is to choose the **field** that you are going to join with. Click on the small arrow next to Join field and select **id**. This means that you are going to use the id column to make the join.



Step 24 – Click on the small arrow next to **Target field** and select **id**.

Step 25 – Click OK.

Step 26 – Click **Apply** and then **OK**.

Step 27 – Right click on the **Buildings** layer and open the attribute table. You will see that the information from the **Buildings data** has been joined to the **Buildings** layer. What you just did was join the two tables using their id numbers. In the csv file, the row with the id number 1 is joined to the row in the attribute table with the id number 1.

**You should now, understand how important it is to have id numbers for each feature*.

17. 3 – Symbolizing.

**Now you are going to symbolize the different types of buildings*.

Step 28 – Right click on the Buildings layer and select **Properties**.

Step 29 – Go to Chapter 11.3 and follow step 50 – 52.

Step 30 – Click on the drop down list next to Symbol and select **Building** (or whichever field you would like to categorize) and click **Classify**.

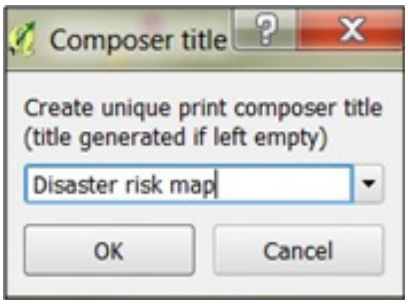
Step 31 – Click Apply and OK.

Step 32 – Right click on the Areas at risk and categorize the different vulnerabilities. (You may need to change the Transparency, if needed).

Step 33 – Once you have finished highlighting all these areas at risk and the buildings within it, you are now ready to create your map.

Step 34 – Go to **Project** in the top left hand corner of the QGIS interface and click on **New Print Composer**.

Step 35 – Type in the title **Disaster Risk Map**.



Step 36 – Click **OK**.

Step 37 – Now create your disaster risk map using the knowledge you learned in **Chapter 9**.

- Make sure you add; **a title, a legend, a scale, a north arrow and your name**.

**Don't forget to save your map in a JPEG form with a 300 dpi resolution!*

- You can also create a map of the gardens and plantations affected by each natural disaster. Just perform a query and follow the steps in this chapter.
- Once you have created your map, save your map project and close QGIS.

Congratulations

You have created shapefiles and a database for your village. You have also created a Disaster Risk map for your village which is very useful for government and other organizations in assisting your village.

Chapter 18 – Risk and Disease Incidence Map

Objectives:

By the end of this Chapter, you should be able to:

- Create a map to show the disease incidence in relation to the areas at risk.

In this chapter, you will be working entirely on your own using the knowledge and skills you have learned from all the earlier chapters. Now that you have created a risk map with all the areas that are at risk, now you are going to see whether the common diseases in each household are related to the disasters.

Step 1 – Start QGIS, add the image of your community.

Step 2 – Add the **Buildings.shp** and any other layers you would like to include (if any).

Step 3 – Add the **Buildings data** spreadsheet and join it with the **Buildings** layer. **If you have forgotten how to join tables, refer to chapter 15*.

Step 4 – Right click on the **Buildings** layer and select **Properties**.

Step 5 – Click on the **Style** tab. Right now this layer has only one symbol, meaning all the points are represented by a single colour and symbol.

Step 6 – Click on the drop down arrow next to Single symbol. In this list are different ways to symbolize your data.

Step 7 – From the list click **Categorized**, so that you can symbolize the households with the common disease 1.

Step 8 – Next to symbol, click on the drop down list and select common disease 1.

Step 9 – Click **classify**.

Step 10 – You should now be looking at the different common diseases experienced in each households being symbolized with different colours.

Step 11 – Select the colour with no attribute right at the bottom of the list and select delete to remove it from the list.

Step 12 – Right now, the colours are set randomly, however you can choose your own colours by clicking on the Colour ramp to change it.

Step 13 – You can also change the colours by clicking the colour symbols. This will allow you to choose the colours to represent each disease. On your map, the different households should be symbolized with different colours according to the common disease 1.

Step 14 – Do this for Common Disease 2 and 3.

- Once you finish, you should have different point features that represent households with different diseases.

Step 15 – Add the **Areas at risk** shapefile and change the colour to red and **Transparency** to 70%. This layer should be on top of the image.

- Make sure you order the features in the Layers window, from points, lines and then polygons.

Step 16 – Once you are done, go to **Projects** and create your map.

Step 17 – Give your map an appropriate title such as **Areas at risk in (name of your village) and disease incidence map**.

Step 18 – Don't forget to put all the important elements of a map.

Step 19 – Open the map that you have just created and study it carefully. Do you think that the diseases are related to the vulnerabilities? Do you think that the vulnerabilities may have caused these diseases? Why?

- Remember you collected a lot of data from your community. You can even create a map to show the type of building material for all the buildings in your community. All you have to do is join the tables, perform a query and save as a new shapefile.

Congratulations

You have successfully created a risk and disease incidence map of your community. You can now take your maps and show it to your village elders so you can create a strategic plan to present to your local governments to assist your community.

Chapter 19 – Create an action plan for your community using the disaster risk map

- Before you create your action plan, present your maps to the people in your community and allow them to check whether your map is accurate. After your community have checked your map and agree you and your community members will create an action plan. This plan should address the problems or the issues you have highlighted in your map. You can use your maps and action plan to propose to your local government or donor bodies to seek funding to help your community.

- With the members of your community discuss your findings and discuss a possible strategic plan that you can use to present to local authorities.

**Your community action plan should provide solutions (that your community has agreed on)*.

Here is a simple guide on what you should include in your strategic plan.

- Explain in three lines what this action plan is and why it is important.

- State clearly what are the problems or vulnerabilities that your community is trying to address. Use the map and data you have collected of your community to describe the problem.

- List the problems and rank them from most important to least important, if there is more than one problem in the community. ***The most important one will be the issue that your action plan should work to address*.

- List ways in which men, women and youth groups have identified as solutions to solve the problem/ vulnerabilities.

- State whether the community has any financial resources to carry out the tasks to solve the problem.

- For the solution listed, identify key people that will be involved in each task.

- Provide a set time frame in which you think it will take to get the work done.

- Identify the community resource and resource that the community may need assistance on.

- Create a budget for the financial resources needed to carry out the action plan.

Example of action plan.

Action plan for Village A, 2015.

1. This action plan addresses the issue of water shortage in Village A. Village A has 36 households with a total population of 89. The main water source for the village is the nearby river which is not very clean. Of the 36 households, only 5 houses have a rainwater tanks but usually run out of water.

2. Map shows how many households have access to water. Total population in each household and water use per household.

Issue / Vulnerability	Solution (s)	Group tasks	Time frame	Community resource	Assistance needed
Water Shortage	Install 4 Rotomould tanks. 2 at the church and 2 at the village school.	Men and youth to assist in repairing roof.	3 weeks	Workers	Provision of iron and technical assistance.
		Women prepare meals for workers.	3 weeks	Workers. Local produce for food.	None
		Men and youth to assist in installation of tanks.	2 Days	Workers.	Provision of tanks and technical assistance. Transportation of tanks to village.

**Once community members agree with plan, it is now ready to be presented to local government, NGO etc. for assistance*

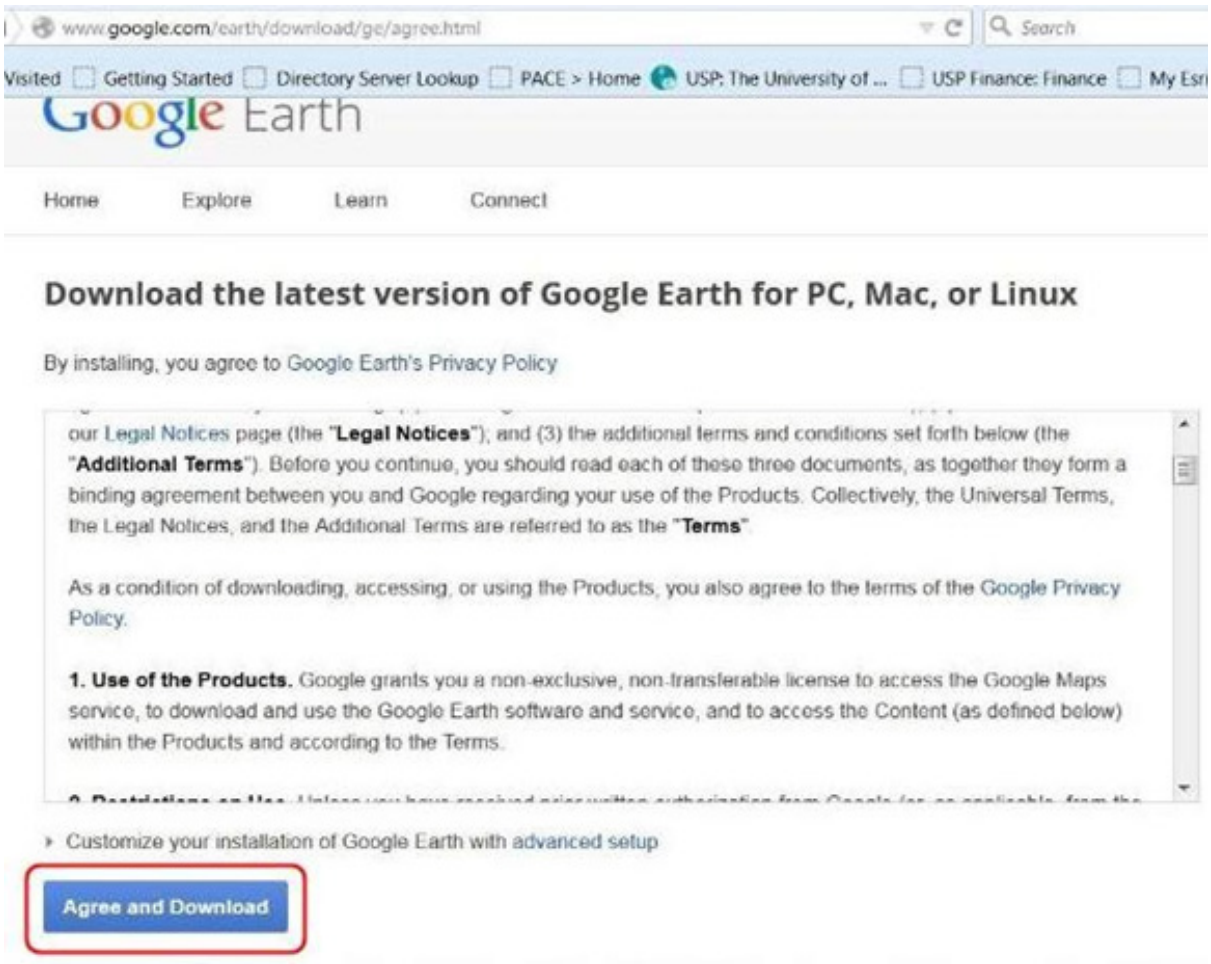
Chapter 20 – Downloading and installing Google Earth and QGIS

This chapter only applies to users that have access to internet to download and install Google Earth and QGIS, if you do not have it installed on your computer. In order to create your community maps, you will need a base map. A Google Earth image is a good base map for you to view the features of the area you want to map.

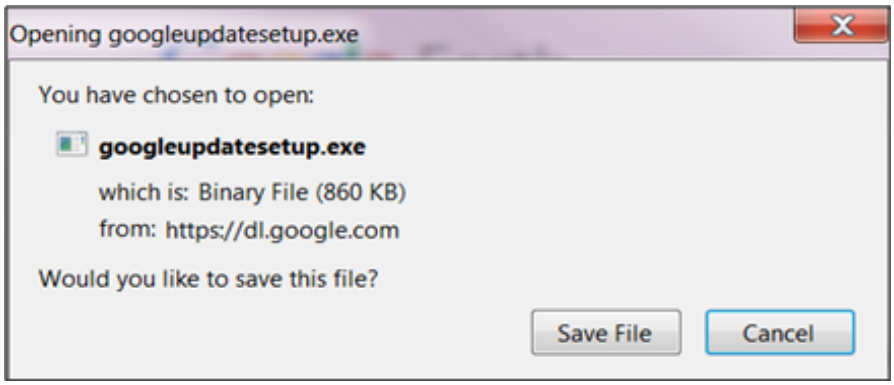
20. 1 Downloading Google Earth

Step 1 – Google Earth - If you do not have Google Earth installed you can click on this link to download. http://www.google.com/earth/download/ge/agree.html

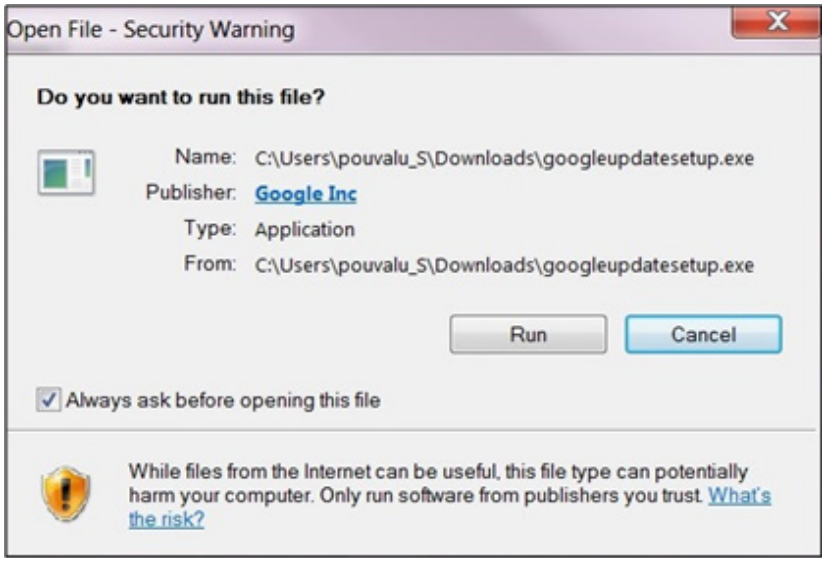
Step 2 – Click **Agree** and **Download**.



Step 3 – Click on **Save File**. **This will make sure that you are saving the Google Earth setup file onto your computer.*



Step 4 – Click **Run**.



- You should now be seeing the download and installation window.

Step 5 – Once the installation is complete, click **Close**.

Step 6 – You should now see a Google Earth shortcut icon on your desktop. Go ahead and double click on it to open.

Step 7 – Once Google Earth has started you can go ahead and explore the globe by zooming in and out.

20. 2 Downloading QGIS

**If you do not have QGIS installed on your computer or should you ever lose the copy of the QGIS software, you can always download the latest version available*.

QGIS 2.8 is the latest version of the QGIS soft ware at the time of this publication. If you have access to the internet, you can always check for the latest version from the link on the next page.

Step 7 – To download the latest version of QGIS click on this link https://www.qgis.org/en/site/forusers/download.html and follow the instructions on how to download and install. Note that the QGIS software may be updated to a newer version from time to time.

Installing QGIS

- After clicking on the link above, you will be directed to the QGIS web page.
- Notice that there are two versions; one is a 32 bit and the other 64 bit.
- Before you click to download the software. You will need to find out whether your computer is a 32 bit or 64 bit (operating system). This will ensure that you download the correct version for your computer.

Step 8 – To find out what operating system your computer has, go to Chapter 3 step 2-4.

Step 9 – Now that you know your operating systems, go back to your web browser again and download QGIS.

Step 10 – Click on the **version** that is suitable for your computer to download QGIS.

Step 11 – Follow the instructions in Chapter 5 for installation.

20. 3 Downloading Apache OpenOffice

Step 20 – If you do not have Microsoft Excel installed on your computer, you can use Apache OpenOffice. Apache Open Office is a free version of Microsoft Excel. To download the latest version of Apache OpenOffice click on this link and follow the instructions. https://www.openoffice.org/download/

Chapter 21 – Georeferencing a Google Earth image

21. 1 Taking a snap shot of site.

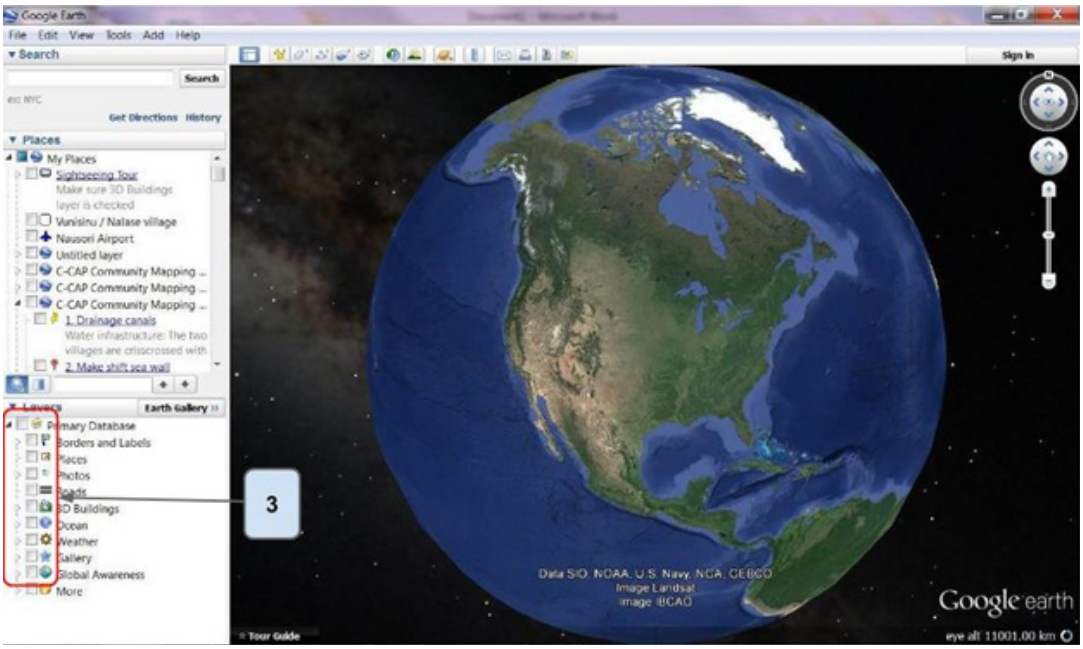
Georeferencing
The process of assigning real world coordinates to a pixel of a raster image. Every image that you are going to use as a base map should be georeferenced!

Saving a Google Earth image

Step 1 – Start Google Earth.
**Make sure that your view angle is vertical (bird's view). When saving an image for mapping, you have to make sure that it is not tilted*.

Step 2 – If your view is oblique (tilted) you can change the angle by clicking on **View > Reset > Tilt**.

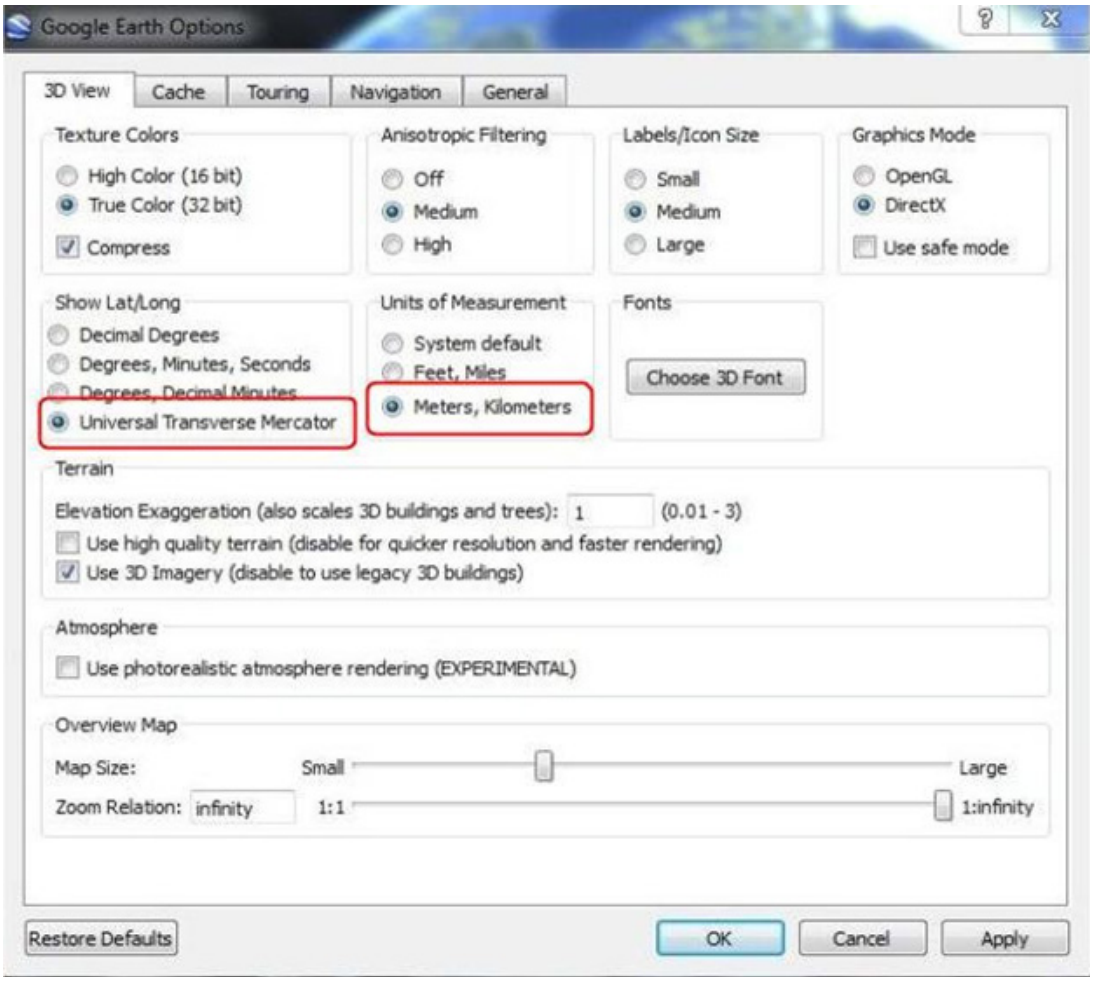
Step 3 – Turn off all layers by checking each item on the **Layers** sidebar.



Step 4 – Make sure that the map projection is Decimal degrees. Go to **TOOLS** and select **Options**. Click on the **3D View** tab and select **Universal Transverse Mercator (UTM)**. **The reason you are choosing UTM for coordinate system, is so you can measure distance in linear units in your map i.e. meters, kilometers etc*.

Step 5 – Change the Units of measurement to Meters, Kilometers.

Step 6 – Click **APPLY** and then **OK**.



Step 7 – Make sure the scale bar is visible so that you can see and approximate distances. Go to **View** and check the scale legend.

Step 7 – Once you have checked the Scale Legend, the scale bar will now be visible on your screen.

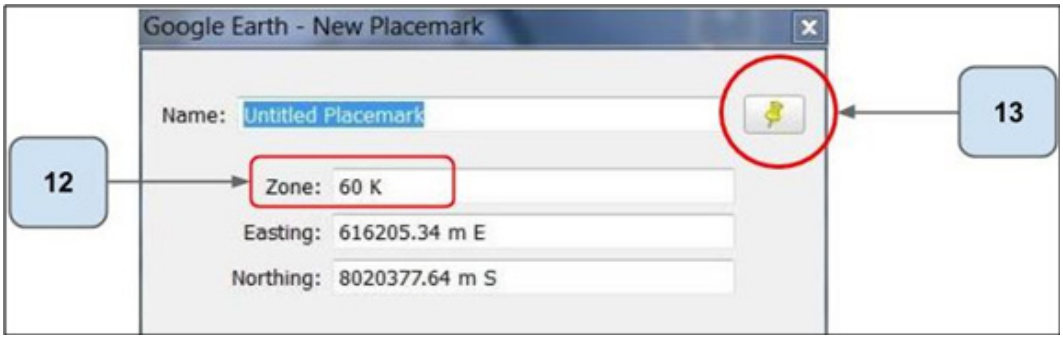
Step 8 – Type the name of your community or area in the Search tab.

Step 9 – Zoom in to the island in which your community is located in.

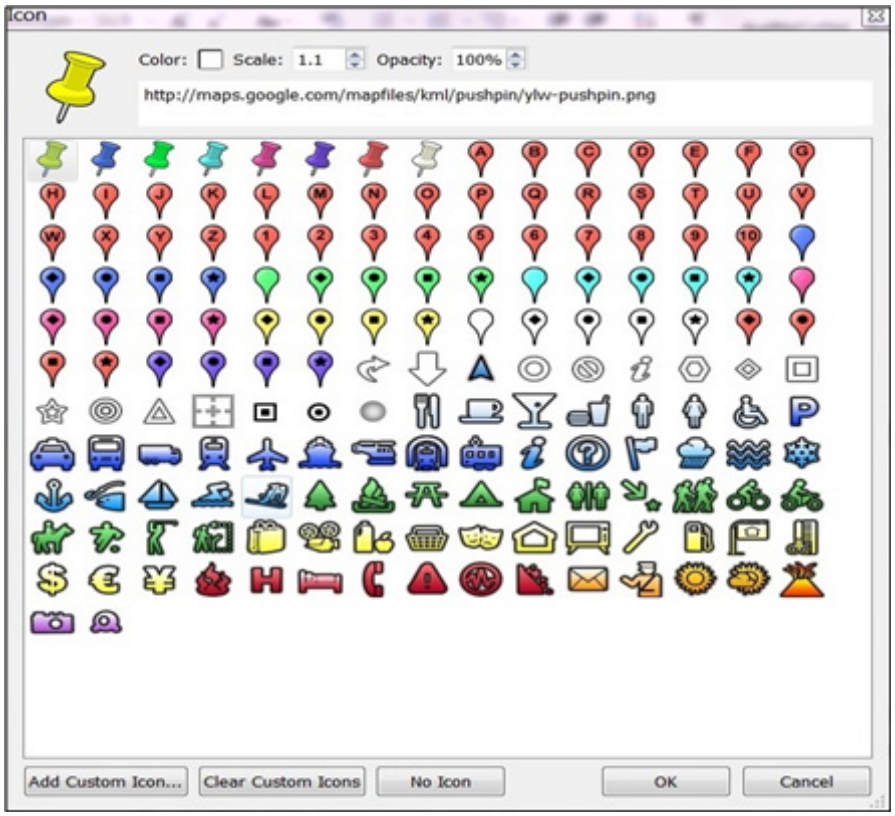
Step 10 – Once the entire island or community fits perfectly on your screen, add Ground Control Points (GCP's). **When you add ground control points, you are recording the coordinates for each point. These points are an example of* **absolute location**. *To read more on Absolute location go to* **Chapter 8**.

Step 11 – You will add 4 GCP, one in each corner of the image of your area of interest. To add a GCP, click on **Add a Placemark** (yellow pushpin in the toolbar).

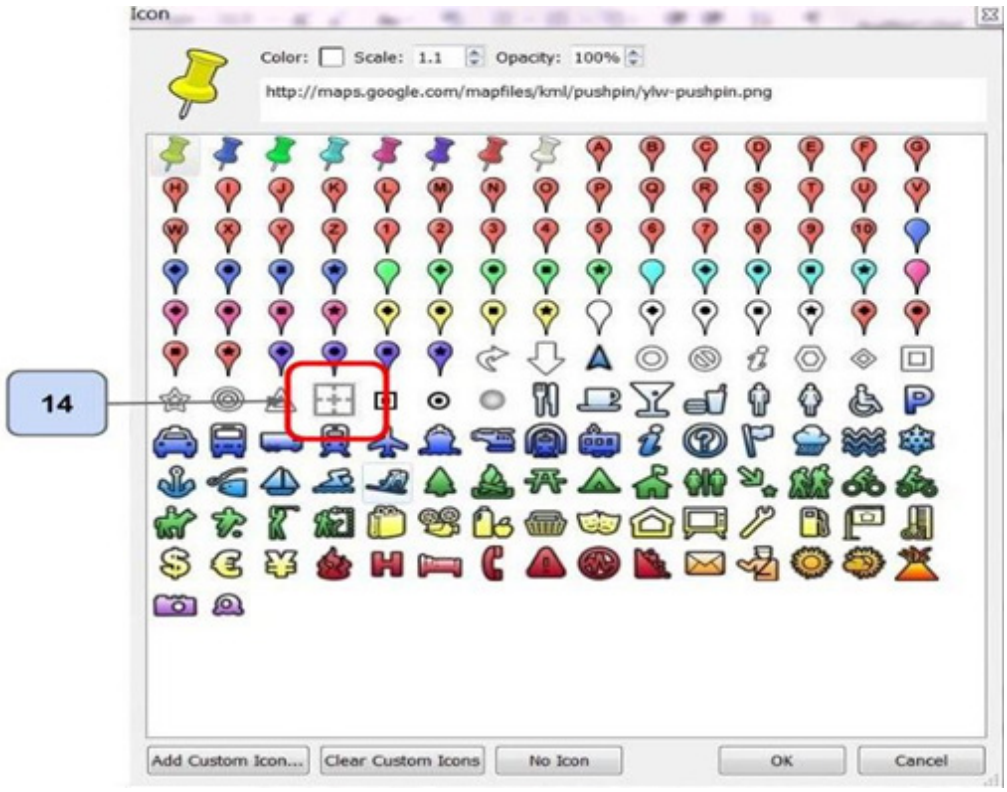
Step 12 – Once the New Placemark window appears, take note of the Zone: 60. The example below shows that the area is in zone 60. The Eastings tell you that it is in the East (E) of the meridian and the Northings tell you that it is in the Southern (S) hemisphere.



Step 13 – Click on the yellow pushpin.



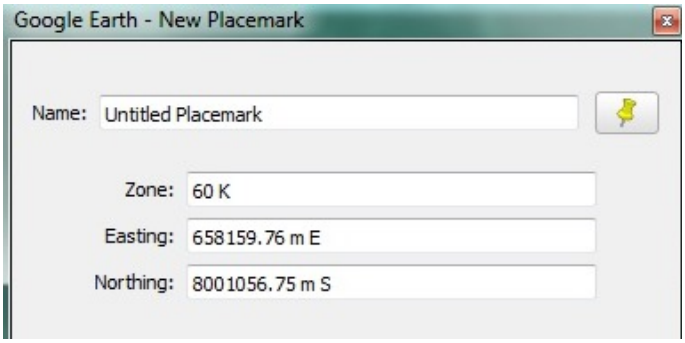
Step 14 – Click on the icon with the square cross-hair. And then click OK.



Step 15 – Name the **Placemark**. Since you will add 4 GCP's, you may name each corner 1, 2, 3 and 4.

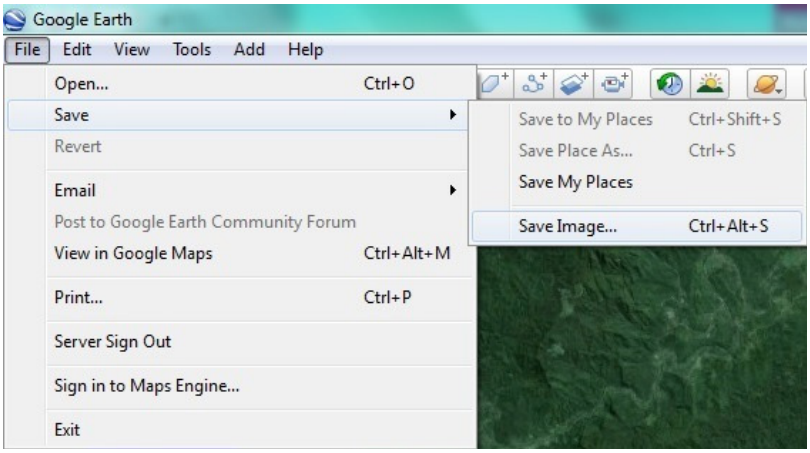
Step 16 – Copy the Eastings and Northings on a piece of paper or on an excel spreadsheet because you will need to enter it later.

Step 17 – Click OK. Do this for all four corners of the image.



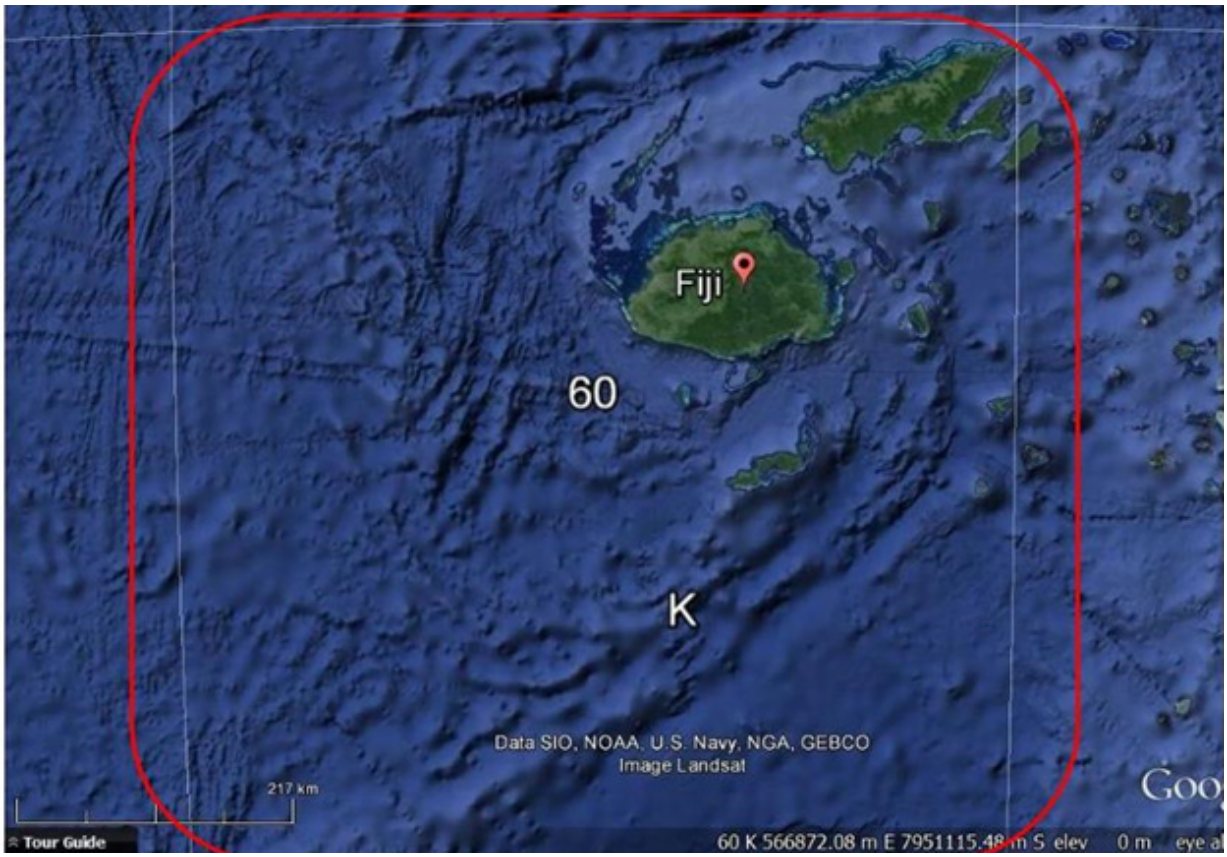
Step 19 – Before you save your image double check that your image is tilted upright. For more information on how to do this go to Step 2.

Step 20 – Go to File, select Save and click on Save Image.



Step 21 – Give your image a name and save it in a folder. **You have just captured an image of the site, it is not yet georeferenced! You still need to define the location of this image*.

Before you close Google Earth, click on View and select Grid. You should see grid lines which you will use to determine which zone your community is in. For example the island of Viti Levu below is in zone 60 south of the equator.



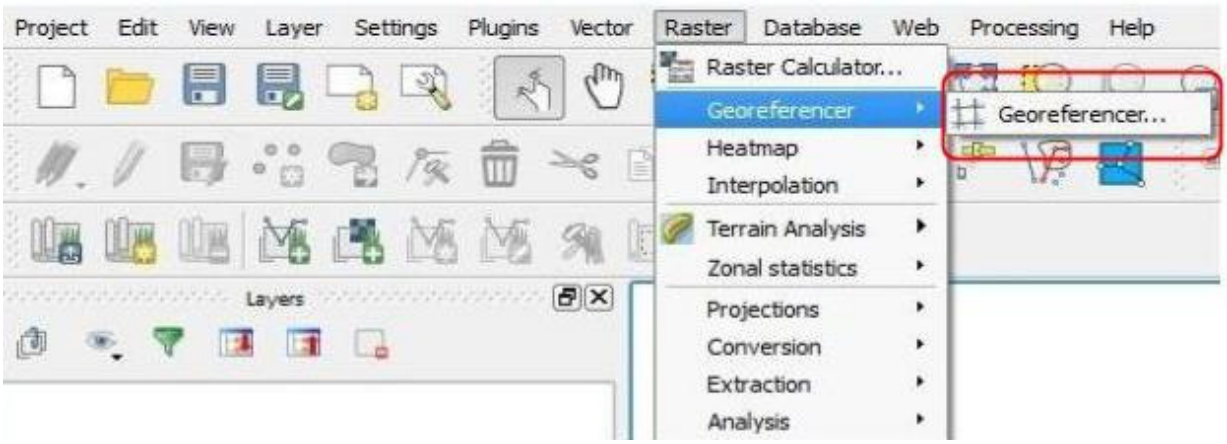
21. 2 Georeferencing an image

- The next few steps will guide you on how to **georeference** an image in QGIS.

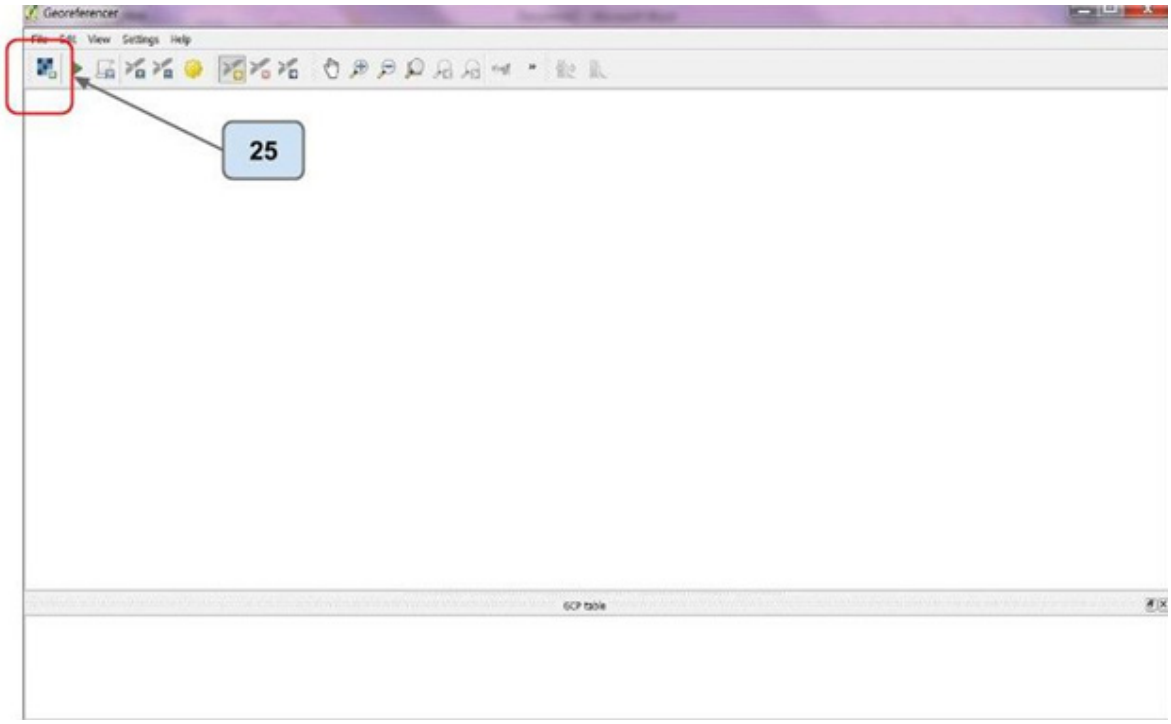
Step 22 – Start QGIS and check whether the **Manage Layers** toolbar is visible. See Image below.

Step 23 – If you do not see this toolbar, right click on any empty grey space on the Toolbar and check the box next to **Manage Layers**.

Step 24 – On your toolbar go to Raster and select **Georeferencer.**



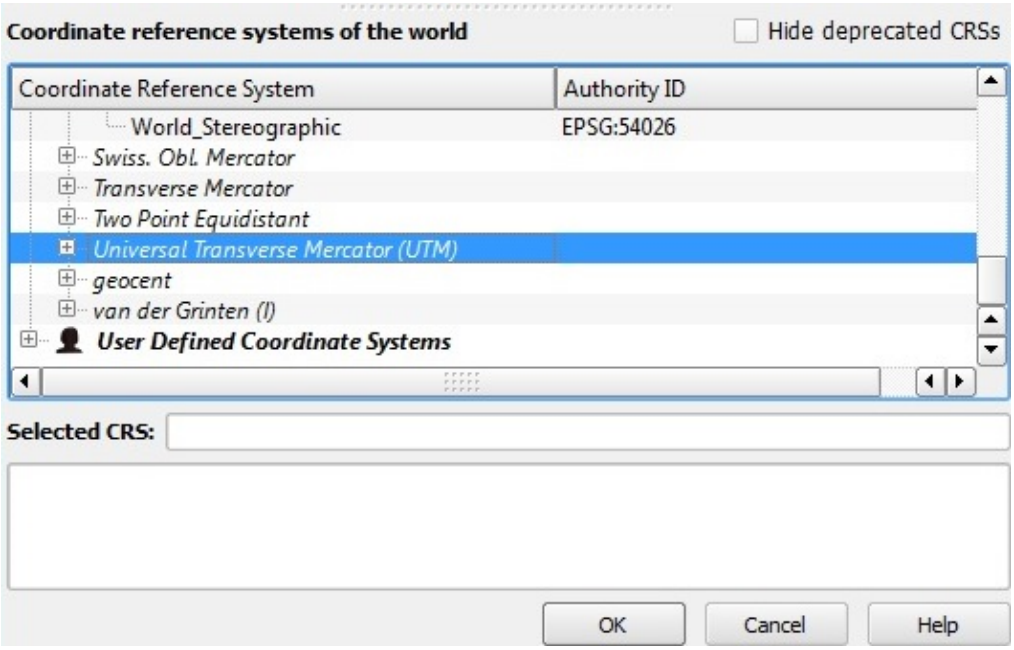
Step 25 – The Georeferencer window will appear. Click on **Open Raster** to add the Google Earth image that you have just saved.



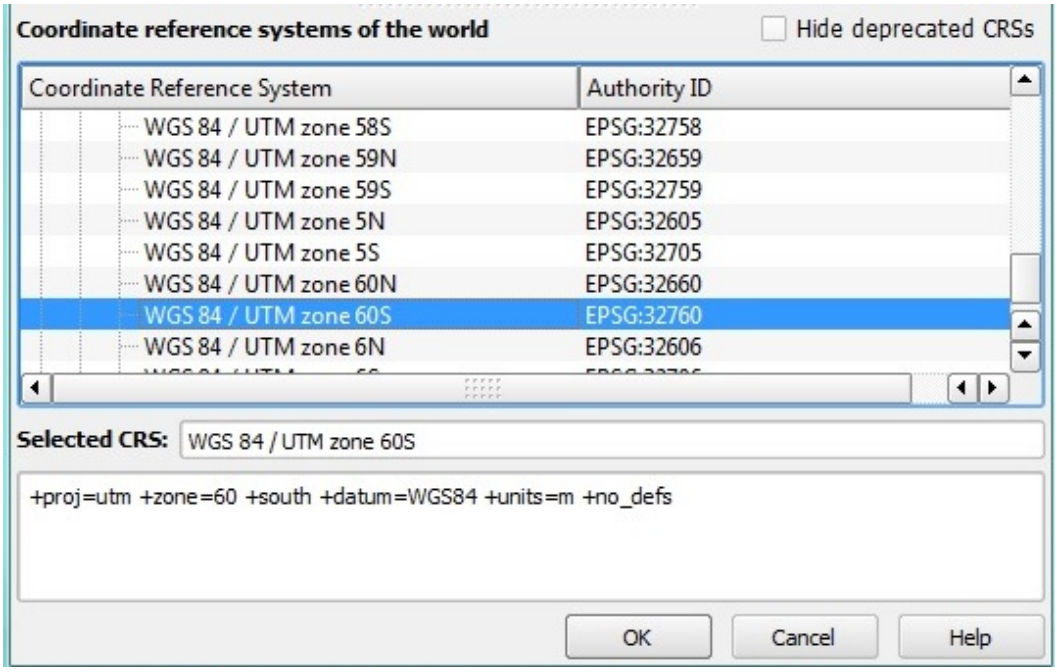
Step 26 – Once the **Open Raster** window appears, go to the folder where you saved your **image** and open it.

Step 27 – Once you click Open, you are required to specify the Coordinate Reference System (CRS) for the image. **Remember when you saved the image on Google Earth, you had selected Universal Transverse Mercator? You will need to use the same coordinate system when you georeference the image*.

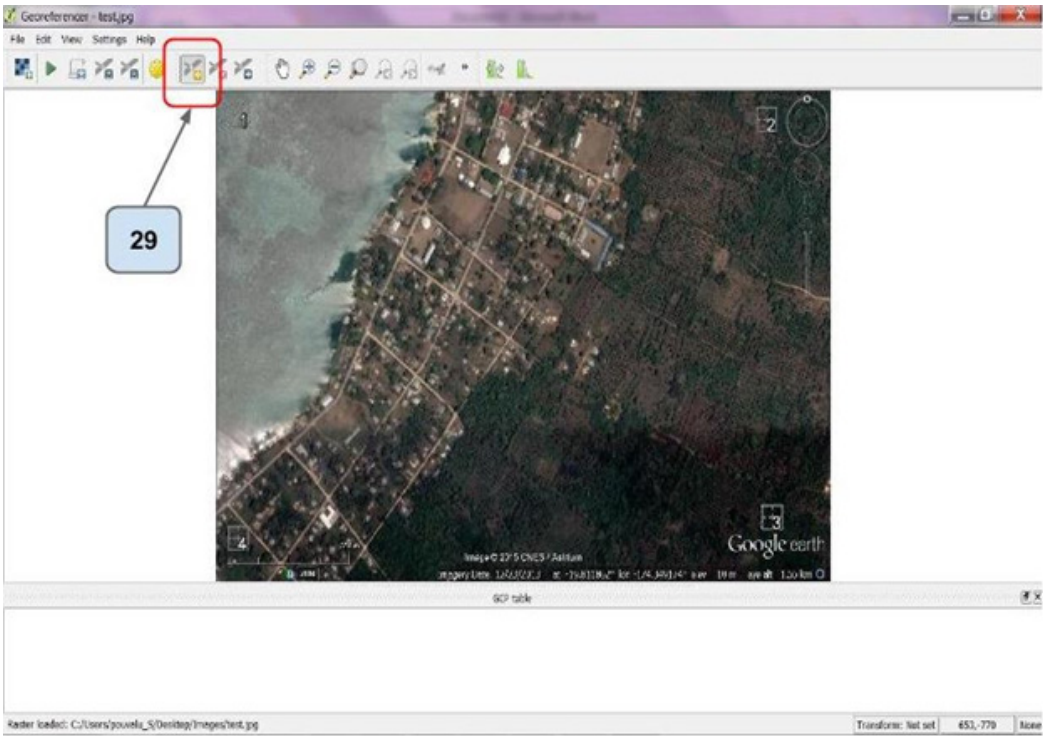
Step 28 – In the **Coordinate Reference Systems** of the world, scroll down the list and click on the plus sign next to **Universal Transverse Mercator** to expand the list



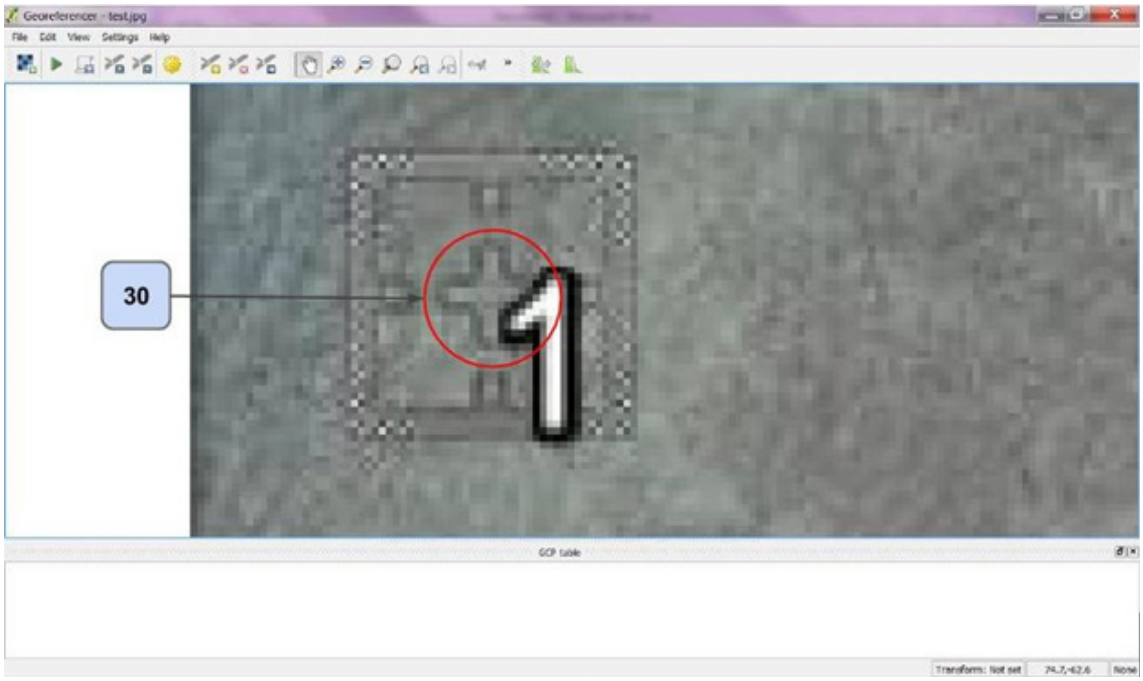
*Depending on the zone of your community/area you are interested in, click on that particular zone. In the example below, it is using **WGS 84 / UTM** zone 60S (this is for Viti Levu main island of Fiji, the S means South of the Equator) and click **OK. (Refer to the zone in Step 12)** You may use a different zone depending on the location of **your community or area of interest**.



Step 29 – Once the image is loaded on to the Georeferencer interface, click on the **Add point** tool to start adding points.

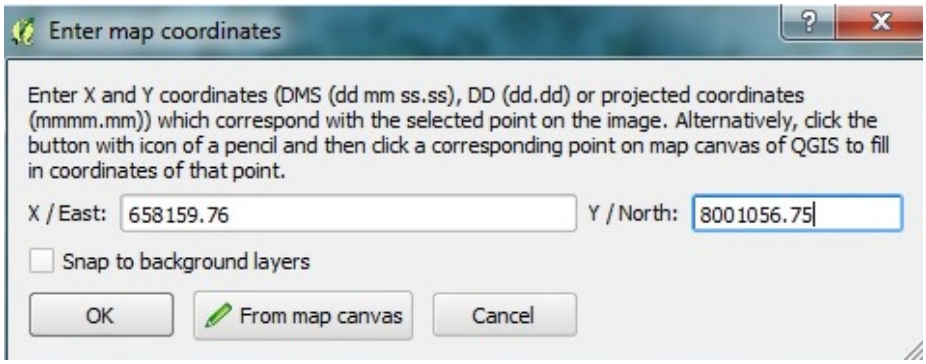


Step 30 – Zoom in to the centre of the crosshair and add a point. Click in the centre of the cross-hair placemark to add a point.

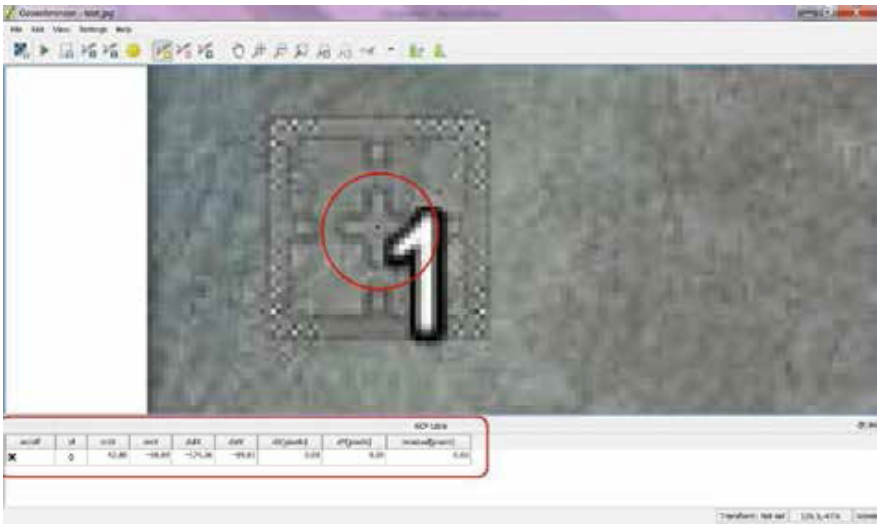


Step 31 – You will then need to add the coordinates for this point. **Remember you copied these coordinates in Step 16? You can go ahead and enter them now*.

Note that, **X/East** corresponds to **Longitude** and **Y/North** corresponds to **Latitude**.



- If ever your image becomes inverted or upside down, then maybe you entered the coordinates for the Y/North in the X/East.



Step 32 – Once you have added all the 4 GCP's, you will need to specify some settings for the output of your image.

Step 33 – Go to **Settings** and select **Transformations**.

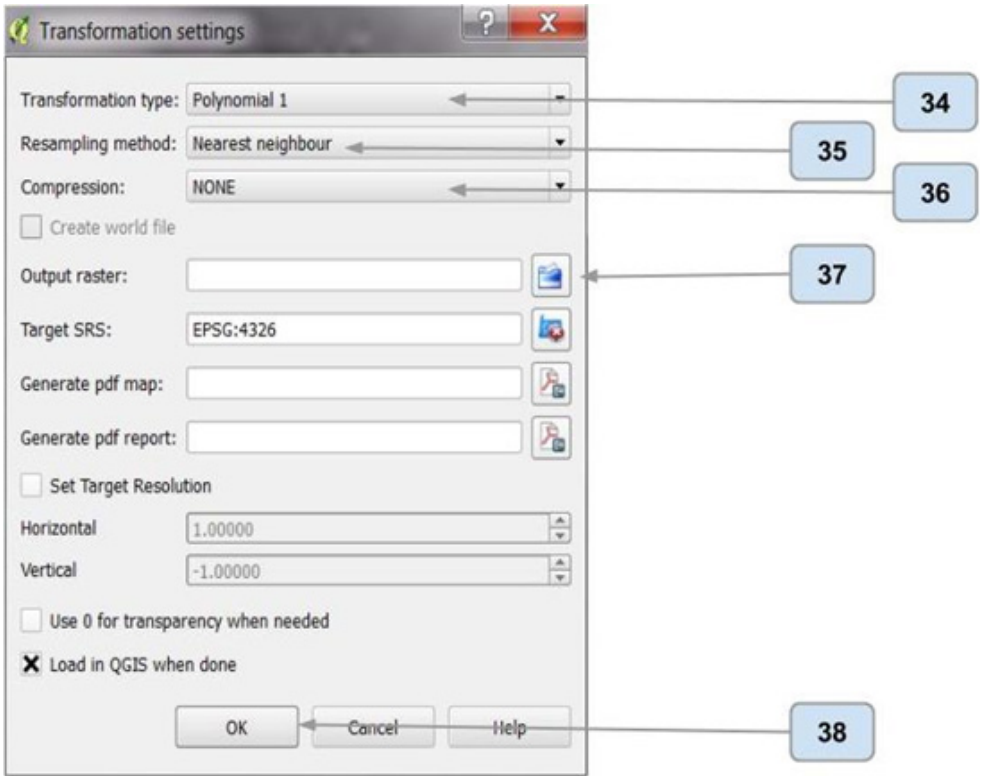
Select 34 – Because you only have four GCP's, use **Polynomial 1**.

Select 35 – Resampling Method: **Nearest neighbour**

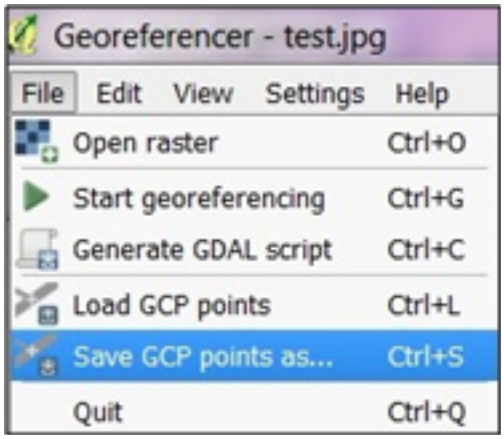
Select 36 – Compression: **NONE**

Select 37 – Click on **Output raster** and save your image in the same folder you saved the google earth image.

Select 38 – Click **OK**.



Select 39 – Go to File and click on Save GCP points and then close the georeferencer.



Congratulations

You have successfully georeferenced a Google Earth image. You may now use this image as a base map and create your own maps. To create your own map using this georeferenced image, go to Chapter 11.

Conclusion

In this Toolkit, you learned how to:

- Install multiple software that you needed to create your community maps.
- Collect relevant data to be mapped.
- Create a geographic database for your community.
- Symbolize and label geographic data.
- Create, edit, delete and save data.
- Manage and join tables.
- Create new shapefiles.
- Performed a query.
- Create disaster risk and disease incidence maps of your community.
- Create a community action plan

Where to from here?

- Continue to practice your GIS skills by creating other maps of your community. You may not be an expert yet, but practice makes PERFECT!
- Update the data for your community regularly.
- Teach people in your community about the risks and vulnerabilities so that they are better informed!

Teach them how to collect data and create maps so that they can continue to assist your community!

APPENDIX 1

Chapter 13 Part 1 – Identifying areas at risk

Name of natural disaster	Name areas in your village that have been affected by this hazard.	List ways in which this natural disaster has affected your village.

Name of natural disaster	Name areas in your village that have been affected by this hazard.	List ways in which this natural disaster has affected your village.

Data Collection Sheet

Id_no Building_ Type	Owner	No. of Males	No. of Females	No of Disabled persons	Source of water 1	Source of water 2	Source of food 1

Source of food 2	Own a plantation	Type of toilet	Sealed, unsealed septic	Roofing material	Affected by natural disaster	Number of persons injured from disaster	Number of deaths as a result of this disaster

Data Collection Sheet

Name of disaster	Common disease 1	Common disease 2	Common disease 3	Common disease 4	Highest level of education

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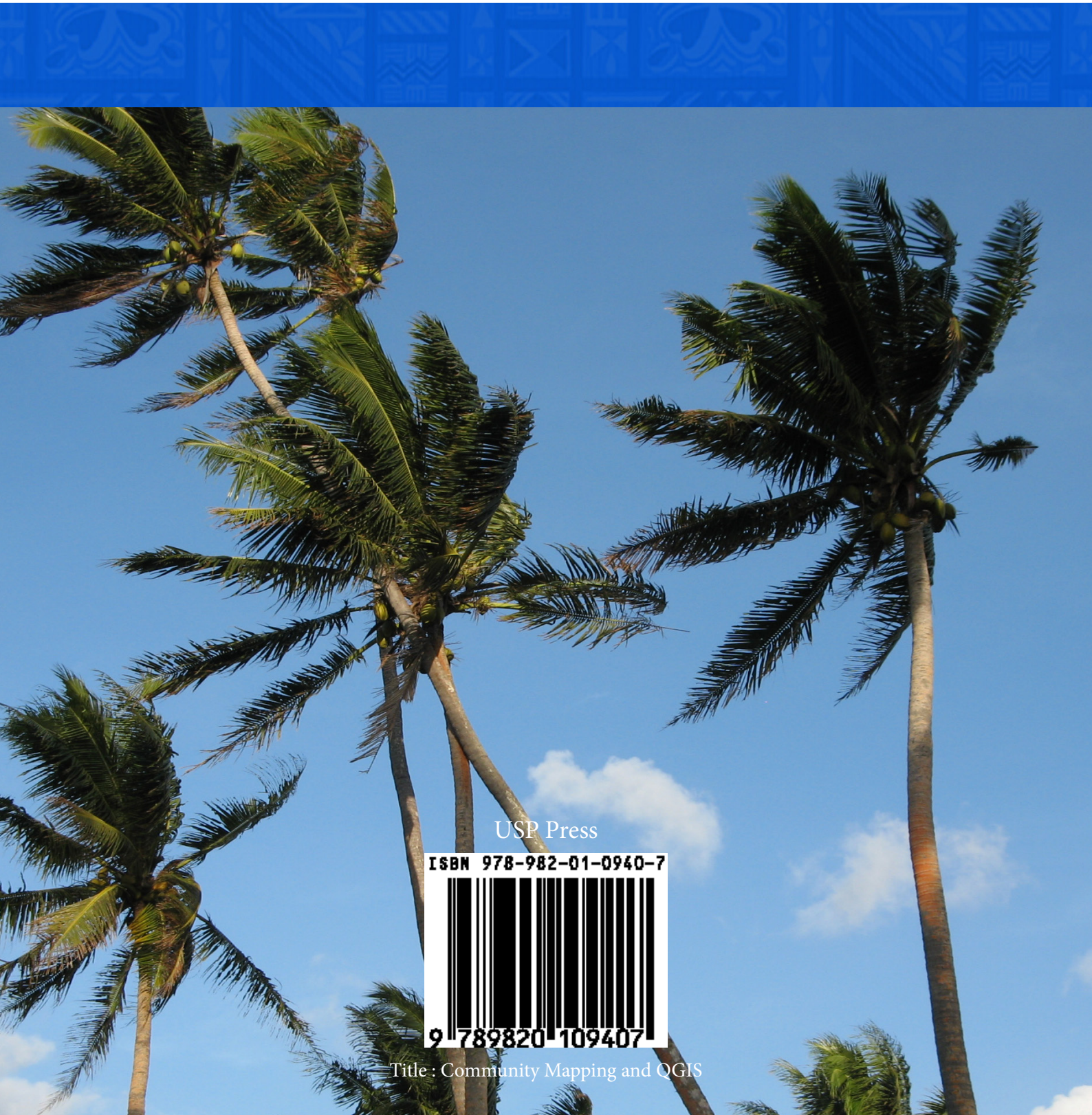

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